GRAY'S

SCHOOL AND FIELD BOOK

OF

BOTANY

CONSISTING OF

"LESSONS IN BOTANY," AND "FIELD, FOREST, AND GARDEN BOTANY,"

BOUND IN ONE VOLUME.

BY ASA GRAY,

FISHER PROFESSOR OF NATURAL HISTORY IN HARVARD UNIVERSITY.

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PUBLISHERS' PREFACE

TO

GRAY'S SCHOOL AND FIELD BOOK OF BOTANY

THIS work consists of the "LESSONS IN BOTANY" and the "FIELD, FOREST AND GARDEN BOTANY," bound together in *one complete volume*, forming a most popular and comprehensive SCHOOL BOTANY, adapted to beginners and advanced classes, to Agricultural Colleges and Schools, as well as to all other grades in which the science is taught; it is also adapted for use as a hand-book to assist in analyzing plants and flowers in field study of botany, either by classes or individuals.

The book is intended to furnish Botanical Classes and beginners with an easier introduction to the Plants of this country, and a much more comprehensive work, than is the MANUAL.

Beginning with the *first principles*, it progresses by easy stages until the student, who is at all diligent, is enabled to master the intricacies of the science.

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This work supplies a great *desideratum* to the Botanist and Botanical Teacher, there being no similar class-book published in this country.

GRAY'S

LESSONS IN BOTANY

AND

VEGETABLE PHYSIOLOGY,

ILLUSTRATED BY OVER 360 WOOD ENGRAVINGS, FROM ORIGINAL DRAWINGS, BY ISAAC SPRAGUE.

TO WHICH IS ADDED A COPIOUS

GLOSSARY,

OR

DICTIONARY OF BOTANICAL TERMS

BY ASA GRAY
FISHER PROFESSOR OF NATURAL HISTORY IN HARVARD UNIVERSITY.

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NEW YORK AND CHICAGO.
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It is by no means indispensable for students to go through the volu
before commencing with the analysis of plants. When the proper seas
for botanizing arrives, and when the first twelve Lessons have been go
over, they may take up Lesson XXVIII. and the following ones, and pr
ceed to study the various wild plants they find in blossom, in the mann
illustrated in Lesson XXX., &c., — referring to the Glossary, and then
to the pages of the Lessons, as directed, for explanations of the vario
distinctions and terms they meet with. Their first essays will necessaril
be rather tedious, if not difficult; but each successful attempt smooth
the way for the next, and soon these technical terms and distinction
will become nearly as familiar as those of ordinary language.

Students who, having mastered this elementary work, wish to exten
their acquaintance with Vegetable Anatomy and Physiology, and to consider higher questions about the structure and classification of plants, wil
be prepared to take up the author's *Botanical Text-Book*, an *Introduction to Structural Botany*, or other more detailed treatises.

No care and expense have been spared upon the illustrations of this volume; which, with one or two exceptions, are all original. They were drawn from nature by Mr. Sprague, the most accurate of living botanical artists, and have been as freely introduced as the size to which it was needful to restrict the volume would warrant.

To append a set of questions to the foot of each page, although not unusual in school-books, seems like a reflection upon the competency or the faithfulness of teachers, who surely ought to have mastered the lesson before they undertake to teach it; nor ought facilities to be afforded for eaching, any more than learning, lessons by rote. A full *analysis of the ontents* of the Lessons, however, is very convenient and advantageous. Such an Analysis is here given, in place of the ordinary table of conents. This will direct the teacher and the learner at once to the leading leas and important points of each Lesson, and serve as a basis to ground roper questions on, if such should be needed.

ASA GRAY.

HARVARD UNIVERSITY, CAMBRIDGE,
January 1, 1857.

** Revised August, 1868, and alterations made adapting it to the new edition of *nual*, and to *Field, Forest, and Garden Botany*, to which this work is the proper oduction and companion.

ANALYSIS OF THE LESSONS.*

LESSON I. — BOTANY AS A BRANCH OF NATURAL HISTORY. . . p. 1.

1. Natural History, its subjects. 2. The Inorganic or Mineral Kingdom, what it is: why called Inorganic. 3. The Organic world, or the world of Organized beings, why so called, and what its peculiarities. 4. What kingdoms it comprises. 5, 6. Differences between plants and animals. 7. The use of plants: how vegetables are nourished; and how animals.

8. Botany, how defined. 9. Physiology, and Physiological Botany, what they relate to. 10. Systematic Botany, what it relates to: a Flora, what it is. 11. Geographical Botany, Fossil Botany, &c., what they relate to.

LESSON II. — THE GROWTH OF THE PLANT FROM THE SEED. . p. 4.

12. The Course of Vegetation: general questions proposed. 13. Plants formed on one general plan. 14. The Germinating Plantlet: 15. exists in miniature in the seed: 16. The Embryo; its parts: 17, 18. how it develops. 19. Opposite growth of Root and Stem: 20. its object or results: 21, 22. the different way each grows.

LESSON III. GROWTH OF THE PLANT FROM THE SEED; continued. p. 9.

23. Recapitulation: Ascending and Descending Axis. 24, 25. The Germinating Plantlet, how nourished. 26. Deposit of food in the embryo, illustrated in the Squash, &c.: 27. in the Almond, Apple-seed, Beech, &c.: 28. in the Bean: 29. in the Pea, Oak, and Buckeye: peculiarity of these last. 30, 31. Deposit of food outside of the embryo: Albumen of the seed: various shapes of embryo. 32, 33. Kinds of embryo as to the number of Cotyledons: dicotyledonous: monocotyledonous: polycotyledonous. 34, 35. Plan of vegetation. 36. Simple-stemmed vegetation illustrated.

LESSON IV. THE GROWTH OF PLANTS FROM BUDS AND BRANCHES. p. 20.

37, 38. Branching: difference in this respect between roots and stems. 39. Buds, what they are, and where situated: 40. how they grow, and what they become. 41. Plants as to size and duration: herb, annual, biennial, perennial: shrub: tree. 42. Terminal Bud. 43. Axillary Buds. 44. Scaly Buds. 45. Naked Buds. 46. Vigor of vegetation from buds illustrated. 47–49. Plan and arrangement of Branches: opposite: alternate. 50. Symmetry of Branches,

* The numbers in the analysis refer to the paragraphs.

what it depends on: 51. how it becomes incomplete: 51 – 59. how varie(53 Definite growth. 54. Indefinite growth. 55. Deliquescent or dissolvin stems, how formed. 56. Excurrent stems of spire-shaped trees, how producec 57. Latent Buds. 58. Adventitious Buds. 59. Accessory or supernumerar Buds. 60. Sorts of Buds recapitulated and defined.

LESSON V. MORPHOLOGY OF ROOTS. . . . . p. 28.

61 – 64. Morphology; what the term means, and how applied in Botany. 65. Primary Root, simple; and, 66. multiple. 67. Rootlets; how roots absorb; time for transplantation, &c. 68. Great amount of surface which a plant spreads out, in the air and in the soil; reduced in winter, increased in spring. 69. Absorbing surface of roots increased by the root-hairs. 70. Fibrous roots for absorption. 71. Thickened or fleshy roots as storehouse of food. 72, 73. Their principal forms. 74. Biennial roots; their economy. 75. Perennial thickened roots. 76. Potatoes, &c. are not roots. 77. Secondary Roots, their economy. 78. Sometimes striking in open air, when they are, 79 Aerial Roots; illustrated in Indian Corn, Mangrove, Screw Pine, Banyan, &c. 80. Aerial Rootlets of Ivy. 81. Epiphytes or Air-Plants, illustrated. 82. Parasitic Plants, illustrated by the Mistletoe, Dodder, &c.

LESSON VI. MORPHOLOGY OF STEMS AND BRANCHES. . . . p. 36.

83 – 85. Forms of stems and branches above ground. 86. Their direction or habit of growth. 87. Culm, Caudex, &c. 88. Suckers: propagation of plants by division. 89. Stolons: propagation by layering or laying. 90. Offsets. 91. Runners. 92. Tendrils; how plants climb by them: their disk-like tips in the Virginia Creeper. 93. Tendrils are sometimes forms of leaves. 94. Spines or Thorns; their nature: Prickles. 95. Strange forms of stems. 96. Subterranean stems and branches. 97. The Rootstock or Rhizoma, why stem and not root. 98. Why running rootstocks are so troublesome, and so hard to destroy. 99 – 101. Thickened rootstocks, as depositories of food. 102. Their life and growth. 103. The Tuber. 104. Economy of the Potato-plant. 105. Gradations of tubers into, 106. Corms or solid bulbs: the nature and economy of these, as in Crocus. 107. Gradation of these into, 108. the Bulb: nature of bulbs. 109, 110. Their economy. 111. Their two principal sorts. 112. Bulblets. 113. How the foregoing sorts of stems illustrate what is meant by morphology. 114. They are imitated in some plants above ground. 115. Consolidated forms of vegetation, illustrated by Cactuses, &c. 116. Their economy and adaptation to dry regions.

LESSON VII. MORPHOLOGY OF LEAVES. . . . . p. 49.

117. Remarkable states of leaves already noticed. 118, 119. Foliage the natural form of leaves: others are special forms, or transformations; why so called. 120. Leaves as depositories of food, especially the seed-leaves; and, 121. as Bulb-scales. 122. Leaves as Bud-scales. 123. As Spines. 124. As Tendrils. 125. As Pitchers. 126. As Fly-traps. 127 – 129. The same leaf serving various purposes.

LESSON VIII. MORPHOLOGY OF LEAVES AS FOLIAGE. . . . p. 54.

130. Foliage the natural state of leaves. 131. Leaves a contrivance for increasing surface: the vast surface of a tree in leaf. 132, 133. The parts of a leaf. 134. The blade. 135. Its pulp or soft part and its framework. 136. The latter is wood, and forms the ribs or veins and veinlets. 137. Division and use of these. 138. *Venation, or mode of veining.* 139. *Its two kinds.* 140. Netted-veined or reticulated. 141. Parallel-veined or nerved. 142. The so-called veins and nerves essentially the same thing; the latter not like the nerves of animals. 143. How the sort of veining of leaves answers to the number of cotyledons and the kind of plant. 144. Two kinds of parallel-veined leaves. 145, 146. Two kinds of netted-veined leaves. 147. Relation of the veining to the shape of the leaf. 148 - 151. Forms of leaves illustrated, as to general outline. 152. As to the base. 153. As to the apex.

LESSON IX. MORPHOLOGY OF LEAVES AS FOLIAGE; continued. p. 61.

154, 155. Leaves either simple or compound. 156 - 162. Simple leaves illustrated as to particular outline, or kind and degree of division. 163. Compound leaves. 164. Leaflets. 165. Kinds of compound leaves. 166, 167. The pinnate, and, 168. the palmate or digitate. 169. As to number of leaflets, &c. 170. Leaflets, as to lobing, &c. 171, 172. Doubly or trebly compound leaves of both sorts. 173. Peculiar forms of leaves explained, such as: 174. Perfoliate: 175. Equitant: 176. Those without blade. 177. Phyllodia, or flattened petioles. 178. Stipules. 179. Sheaths of Grasses; Ligule.

LESSON X. THE ARRANGEMENT OF LEAVES. . . . . p. 71.

181. Phyllotaxy, or arrangement of leaves on the stem: general sorts of arrangement. 182. Leaves arise only one from the same place. 183. Clustered or fascicled leaves explained. 184. Spiral arrangement of alternate leaves. 185. The two-ranked arrangement. 186. The three-ranked arrangement. 187. The five-ranked arrangement. 188. The fractions by which these are expressed. 189. The eight-ranked and the thirteen-ranked arrangements. 190. The series of these fractions, and their relations. 191. Opposite and whorled leaves. 192. Symmetry of leaves, &c. fixed by mathematical rule. 193. Vernation, or arrangement of leaves in the bud. 194. The principal modes.

LESSON XI. THE ARRANGEMENT OF FLOWERS ON THE STEM, OR INFLORESCENCE. . . . . p. 76.

195. Passage from the Organs of Vegetation to those of Fructification or Reproduction. 196. Inflorescence: the arrangement of flowers depends on that of the leaves. 197. They are from either terminal or axillary buds. 198. Indeterminate Inflorescence. 199. Its sorts of flower-clusters. 200. Flower-stalks, viz. peduncles and pedicels, bracts and bractlets, &c. 201. Raceme. 202. Its gradation into (203) a Corymb, and that (204) into (205) an Umbel. 206. Centripetal order of development. 207. The Spike. 208. The Head.

209. Spadix. 210 Catkin or Ament. 211, 212. Compound inflorescence of the preceding kinds. 213. Panicle. 214. Thyrsus. 215. Determinate Inflorescence explained. 216, 217. Cyme: centrifugal order of development. 218. Fascicle. 219. Glomerule. 221. Analysis of flower-clusters. 222. Combination of the two kinds of inflorescence in the same plant.

LESSON XII. THE FLOWER: ITS PARTS OR ORGANS. . . . . p. 84.

223. The Flower. 224. Its nature and use. 225. Its organs. 226. The Floral Envelopes or leaves of the flower. Calyx and Corolla, together called (227) Perianth. 228. Petals, Sepals. 229. Neutral and "double" flowers, those destitute of, 230. The Essential Organs: Stamens and Pistils. 231, 232. The parts of the flower in their succession. 233. The Stamen: its parts. 234. The Pistil: its parts.

LESSON XIII. THE PLAN OF THE FLOWER . . . . p. 88.

235. Flowers all constructed upon the same plan. 236. Plan in vegetation referred to. 237–239. Typical or pattern flowers illustrated, those at once perfect, complete, regular, and symmetrical. 241. Imperfect or separated flowers. 242. Incomplete flowers. 243. Symmetry and regularity. 244. Irregular flowers. 245. Unsymmetrical flowers. 246. Numerical plan of the flower. 247. Alternation of the successive parts. 248. Occasional obliteration of certain parts. 249. Abortive organs. 250. Multiplication of parts.

LESSON XIV. MORPHOLOGY OF THE FLOWER. . . . . . . p 96.

251. Recapitulation of the varied forms under which stems and leaves appear. 252. These may be called metamorphoses. 253. Flowers are altered branches; how shown. 254. Their position the same as that occupied by buds. 255, 256. Leaves of the blossom are really leaves. 257. Stamens a different modification of the same. 258. Pistils another modification; the botanist's idea of a pistil. 259. The arrangement of the parts of a flower answers to that of the leaves on a branch.

LESSON XV. MORPHOLOGY OF THE CALYX AND COROLLA. . . p. 99.

260. The leaves of the blossom viewed as to the various shapes they assume; as, 261. by growing together. 262. Union or cohesion of parts of the same sort, rendering the flower, 263. Monopetalous or monosepalous; various shapes defined and named. 265 The tube, and the border or limb. 266. The claw and the blade, or lamina of a separate petal, &c. 267. When the parts are distinct, polysepalous, and polypetalous. 268. Consolidation, or the growing together of the parts of different sets. 269. Insertion, what it means, and what is meant by the terms Free and Hypogynous. 270. Perigynous insertion. 271, 272. Coherent or adherent calyx, &c. 273. Epigynous. 274. Irregularity of parts. 275. Papilionaceous flower, and its parts. 276. Labiate or bilabiate flowers. 277, 278. Ligulate flowers: the so-called compound flowers.

LESSON XVI. ÆSTIVATION, OR THE ARRANGEMENT OF THE CALYX AND COROLLA IN THE BUD. . . . p. 108.

279. Æstivation or Præfloration defined. 280. Its principal modes illustrated, viz. the valvate, induplicate, reduplicate, convolute or twisted, and imbricated. 282, 283. Also the open, and the plaited or plicate, and its modification, the supervolute.

LESSON XVII. MORPHOLOGY OF THE STAMENS. . . . . . p. 111.

284. Stamens considered as to, 285 Their insertion. 286. Their union with each other. 287, 288. Their number. 289. Their parts. 290. The Filament. 291. The Anther. 292, 293. Its attachment to the filament. 294. Its structure. 295. Its mode of opening, &c. 296. Its morphology, or the way in which it is supposed to be constructed out of a leaf; its use, viz. to produce, 297. Pollen. 298. Structure of pollen-grains. 299. Some of their forms.

LESSON XVIII. MORPHOLOGY OF PISTILS. . . . . p. 116.

300. Pistils as to position. 301. As to number. 302. Their parts; Ovary, style, and stigma. 303, 304. Plan of a pistil, whether simple or compound. 305, 306. The simple pistil, or Carpel, and how it answers to a leaf. 307. Its sutures. 308. The Placenta. 309. The Simple Pistil, one-celled, 310. and with one style. 311, 312. The Compound Pistil, how composed. 313. With two or more cells: 314. their placentæ in the axis: 315. their dissepiments or partitions. 316, 317. One-celled compound pistils. 318. With a free central placenta. 319, 320. With parietal placentæ. 321. Ovary superior or inferior. 322. Open or Gymnospermous pistil: Naked-seeded plants. 323. Ovules. 324. Their structure. 325, 326. Their kinds illustrated.

LESSON XIX. MORPHOLOGY OF THE RECEPTACLE. . . . . p. 124.

327. The Receptacle or Torus. 328–330. Some of its forms illustrated. 331. The Disk. 332. Curious form of the receptacle in Nelumbium.

LESSON XX. THE FRUIT. . . . . p. 126.

333. What the Fruit consists of. 334. Fruits which are not such in a strict botanical sense. 335. Simple Fruits. 336, 337. The Pericarp, and the changes it may undergo. 338. Kinds of simple fruits. 339. Fleshy fruits. 340. The Berry. 341. The Pepo or Ground-fruit. 342. The Pome or Apple-fruit. 343–345. The Drupe or Stone-fruit. 346. Dry fruits. 347. The Achenium: nature of the Strawberry. 348. Raspberry and Blackberry. 349. Fruit in the Composite Family: Pappus. 350. The Utricle. 351. The Caryopsis or Grain. 352. The Nut: Cupule. 353. The Samara or Key-fruit. 354. The Capsule or Pod. 355. The Follicle. 356. The Legume and Loment. 357. The true Capsule. 358, 359. Dehiscence, its kinds. 361. The Silique. 362. The Silicle. 363. The Pyxis. 364. Multiple or Collective Fruits. 365. The Strobile or Cone.

LESSON XXI. THE SEED. . . . . p. 134.

366. The Seed; its origin. 367. Its parts. 360, 369. Its coats. 370. The Aril or Arillus. 371. Names applied to the parts of the seed. 372. The Kernel or Nucleus. 373. The Albumen. 374, 375. The Embryo. 376. The Radicle. 377. The Cotyledons or Seed-leaves: the monocotyledonous, dicotyledonous, and polycotyledonous embryo. 378. The Plumule. 379. The circle of vegetable life completed.

LESSON XXII. HOW PLANTS GROW. . . . . p. 138.

380, 381. Growth, what it is. 382. For the first formation or beginning of a plant dates farther back than to, 383. the embryo in the ripe seed, which is already a plantlet. 384. The formation and the growth of the embryo itself. 385. Action of the pollen on the stigma, and the result. 386. The Embryonal Vesicle, or first cell of the embryo. 387. Its growth and development into the embryo. 388. Growth of the plantlet from the seed. 389. The plant built up of a vast number of cells. 390. Growth consists of the increase in size of cells, and their multiplication in number.

LESSON XXIII. VEGETABLE FABRIC: CELLULAR TISSUE. . . p. 142.

391, 392. Organic Structure illustrated: Cells the units or elements of plants. 393. Cellular Tissue. 394, 395, 397. How the cells are put together. 396. Intercellular spaces, air-passages. 398 Size of cells. 399. Rapidity of their production. 400. Their walls colorless; the colors owing to their contents. 401. The walls sometimes thickened. 402. Cells are closed and whole; yet sap flows from one cell to another. 403. Their varied shapes.

LESSON XXIV. VEGETABLE FABRIC: WOOD. . . . . p. 145.

404. All plants at the beginning formed of cellular tissue only; and some never have anything else in their composition. 405. Wood soon appears in most plants. 406. Its nature. 408. Wood-cells or Woody Fibre. 409. Hard wood and soft wood. 410. Wood-cells closed and whole; yet they convey sap. 411. They communicate through thin places: Pine-wood, &c. 412. Bast-cells or fibres of the bark. 413. Ducts or Vessels. 414. The principal kinds. 415. Milk-vessels, Oil-receptacles, &c.

LESSON XXV. ANATOMY OF THE ROOT, STEM, AND LEAVES. p. 149.

416. The materials of the vegetable fabric, how put together. 417-419. Structure and action of the rootlets. 420. Root-hairs. 421. Structure of the stem. 422. The two sorts of stem. 423. The Endogenous. 423. The Exogenous: 425. more particularly explained. 426. Parts of the wood or stem itself. 427. Parts of the bark. 428 Growth of the exogenous stem year after year. 429. Growth of the bark, and what becomes of the older parts. 431. Changes in the wood; Sap-wood. 432. Heart-wood. 433. This no longer liv-

ing. 434. What the living parts of a tree are; their annual renewal. 435. Cambium-layer or zone of growth in the stem; connected with, 436. new rootlets below, and new shoots, buds, and leaves above. 437. Structure of a leaf: its two parts, the woody and the cellular, or, 438. the pulp; this contains the green matter, or Chlorophyll. 439, 440. Arrangement of the cells of green pulp in the leaf, and structure of its epidermis or skin. 441. Upper side only endures the sunshine. 442. Evaporation or exhalation of moisture from the leaves. 443. Stomates or Breathing-pores, their structure and use. 444. Their numbers.

LESSON XXVI. The Plant in Action, doing the Work of Vegetation. . . . . p. 157.

446. The office of plants to produce food for animals. 447. Plants feed upon earth and air. 449. Their chemical composition. 450. Two sorts of material. 451, 452. The earthy or inorganic constituents. 453. The organic constituents. 454. These form the Cellulose, or substance of vegetable tissue; composition of cellulose. 455. The plant's food, from which this is made. 456. Water, furnishing hydrogen and oxygen. 458. Carbonic acid, furnishing, 457. Carbon. 459. The air, containing oxygen and nitrogen; and also, 460. Carbonic acid; 461. which is absorbed by the leaves, 462. and by the roots. 463. Water and carbonic acid the general food of plants. 464. Assimilation the proper work of plants. 465 Takes place in green parts alone, under the light of the sun. 466-468. Liberates oxygen gas and produces Cellulose or plant-fabric. 469. Or else Starch; its nature and use. 470. Or Sugar; its nature, &c. The transformations starch, sugar, &c. undergo. 471. Oils, acids, &c. The formation of all these products restores oxygen gas to the air. 472. Therefore plants purify the air for animals. 473. While at the same time they produce all the food and fabric of animals. The latter take all their food ready made from plants. 474. And decompose starch, sugar, oil, &c., giving back their materials to the air again as the food of the plant; at the same time producing animal heat. 475. But the fabric or flesh of animals (fibrine, gelatine, &c.) contains nitrogen. 476 This is derived from plants in the form of Proteine. Its nature and how the plant forms it. 477. Earthy matters in the plant form the earthy part of bones, &c. 478. Dependence of animals upon plants; showing the great object for which plants were created.

LESSON XXVII. Plant-Life. . . . . p. 166.

479. Life; manifested by its effects; viz. its power of transforming matter: 480. And by motion. 481, 482. Plants execute movements as well as animals. 483. Circulation in cells. 484. Free movements of the simplest plants in their forming state. 485. Absorption and conveyance of the sap. 486. Its rise into the leaves. 487. Explained by a mechanical law; Endosmose. 488. Set in action by evaporation from the leaves. 489. These movements controlled by the plant, which directs growth and shapes the fabric by an inherent power. 490-492. Special movements of a conspicuous sort; such as seen in the bending, twining, revolving, and coiling of stems and tendrils; in the so-called sleeping and waking states of plants; in movements from irritation, and striking spontaneous motions.

493. Cryptogamous or Flowerless Plants. 494. What they comprise; why so called. 495. To be studied in other works.

LESSON XXVIII. SPECIES AND KINDS. . . . . p. 173.

496. Plants viewed as to their relationships. 497. Two characteristics of plants and animals: they form themselves, and, 498. They exist as Individuals. The chain of individuals gives rise to the idea of, 499, 500. Species: assemblages of individuals, so like that they are inferred to have a common ancestry. 501. Varieties and Races. 502. Tendency of the progeny to inherit all the peculiarities of the parent; how taken advantage of in developing and fixing races. 503. Diversity and gradation of species; these so connected as to show all to be formed on one plan, all works of one hand, or realizations of the conceptions of one mind. 504. Kinds, what they depend upon. 505. Genera. 506. Orders or Families. 507. Suborders and Tribes. 508 Classes. 509. The two great Series or grades of plants. 510. The way the various divisions in classification are ranked.

LESSON XXIX. BOTANICAL NAMES AND CHARACTERS. . . . p. 178.

511, 512. Classification; the two purposes it subserves. 513. Names: plan of nomenclature. 514, 515. Generic names, how formed. 516. Specific names, how formed. 517. Names of Varieties. 518, 519. Names of Orders, Suborders, Tribes, &c. 520, 521. Characters.

LESSONS XXX.–XXXII. HOW TO STUDY PLANTS. pp. 181, 187, 191.

522–567. Illustrated by several examples, showing the mode of analyzing and ascertaining the name of an unknown plant, and its place in the system, &c.

LESSON XXXIII. BOTANICAL SYSTEMS. . . . . p. 195.

568–571. Natural System. 572, 573. Artificial Classification. 574. Artificial System of Linnæus. 575. Its twenty-four Classes, enumerated and defined. 576. Derivation of their names. 577, 578. Its Orders.

LESSON XXXIV. HOW TO COLLECT SPECIMENS AND MAKE AN HERBARIUM. . . . . p. 199.

579–582. Directions for collecting specimens 583, 584. For drying and preserving specimens. 585, 586 For forming an Herbarium.

GLOSSARY, OR DICTIONARY OF BOTANICAL TERMS. . . . . p. 203

FIRST LESSONS

IN

BOTANY AND VEGETABLE PHYSIOLOGY.

LESSON I.

BOTANY AS A BRANCH OF NATURAL HISTORY.

1. THE subjects of Natural History are, the earth itself and the beings that live upon it.

2. **The Inorganic World, or Mineral Kingdom.** The earth itself, with the air that surrounds it, and all things naturally belonging to them which are destitute of life, make up the mineral kingdom, or inorganic world. These are called *inorganic*, or unorganized, because they are not composed of *organs*, that is, of parts which answer to one another, and make up a whole, such as is a horse, a bird, or a plant. They were formed, but they did not grow, nor proceed from previous bodies like themselves, nor have they the power of producing other similar bodies, that is, of reproducing their kind. On the other hand, the various living things, or those which have possessed life, compose

3. **The Organic World,** — the world of organized beings. These consist of *organs;* of parts which go to make up an *individual,* a *being.* And each individual owes its existence to a preceding one like itself, that is, to a parent. It was not merely formed, but *produced.* At first small and imperfect, it grows and develops by powers of its own; it attains maturity, becomes old, and finally dies. It was formed of inorganic or mineral matter, that is, of earth and air, indeed; but only of this matter under the influence of life: and after life departs, sooner or later, it is decomposed into earth and air again.

4. The organic world consists of two kinds of beings; namely, 1. *Plants* or *Vegetables*, which make up what is called the *Vegetable Kingdom;* and, 2. *Animals*, which compose the *Animal Kingdom.*

5. **The Differences between Plants and Animals** seem at first sight so obvious and so great, that it would appear more natural to inquire how they resemble rather than how they differ from each other. What likeness does the cow bear to the grass it feeds upon? The one moves freely from place to place, in obedience to its own will, as its wants or convenience require: the other is fixed to the spot of earth where it grew, manifests no will, and makes no movements that are apparent to ordinary observation. The one takes its food into an internal cavity (the stomach), from which it is absorbed into the system: the other absorbs its food directly by its surface, by its roots, leaves, &c. Both possess organs; but the limbs or members of the animal do not at all resemble the roots, leaves, blossoms, &c. of the plant. All these distinctions, however, gradually disappear, as we come to the lower kinds of plants and the lower animals. Many animals (such as barnacles, coral-animals, and polyps) are fixed to some support as completely as the plant is to the soil; while many plants are not fixed, and some move from place to place by powers of their own. All animals move some of their parts freely; yet in the extent and rapidity of the motion many of them are surpassed by the common Sensitive Plant, by the Venus's Fly-trap, and by some other vegetables; while whole tribes of aquatic plants are so freely and briskly locomotive, that they have until lately been taken for animals. It is among these microscopic tribes that the animal and vegetable kingdoms most nearly approach each other, — so nearly, that it is still uncertain where to draw the line between them.

6. Since the difficulty of distinguishing between animals and plants occurs only, or mainly, in those forms which from their minuteness are beyond ordinary observation, we need not further concern ourselves with the question here. One, and probably the most absolute, difference, however, ought to be mentioned at the outset, because it enables us to see what plants are made for. It is this: —

7. Vegetables are nourished by the mineral kingdom, that is, by the ground and the air, which supply all they need, and which they are adapted to live upon; while animals are entirely nourished by vegetables. The great use of plants therefore is, to take portions of

earth and air, upon which animals cannot subsist at all, and to convert these into something upon which animals can subsist, that is, into food. *All food is produced by plants.* How this is done, it is the province of Vegetable Physiology to explain.

8. **Botany** is the name of the science of the vegetable kingdom in general.

9. **Physiology** is the study of the way a living being lives, and grows, and performs its various operations. The study of plants in this view is the province of *Vegetable Physiology.* The study of the form and structure of the organs or parts of the vegetable, by which its operations are performed, is the province of *Structural Botany.* The two together constitute *Physiological Botany.* With this department the study of Botany should begin; both because it lies at the foundation of all the rest, and because it gives that kind of knowledge of plants which it is desirable every one should possess; that is, some knowledge of the way in which plants live, grow, and fulfil the purposes of their existence. To this subject, accordingly, a large portion of the following Lessons is devoted.

10. The study of plants as to their *kinds* is the province of *Systematic Botany.* An enumeration of the kinds of vegetables, as far as known, classified according to their various degrees of resemblance or difference, constitutes a general *System of plants.* A similar account of the vegetables of any particular country or district is called a *Flora* of that country or district.

11. Other departments of Botany come to view when — instead of regarding plants as to what they are in themselves, or as to their relationship with each other — we consider them in their relations to other things. Their relation to the earth, for instance, as respects their distribution over its surface, gives rise to *Geographical Botany,* or *Botanical Geography.* The study of the vegetation of former times, in their fossil remains entombed in the crust of the earth, gives rise to *Fossil Botany.* The study of plants in respect to their uses to man is the province of *Agricultural Botany, Medical Botany,* and the like.

LESSON II.

THE GROWTH OF THE PLANT FROM THE SEED.

12. **The Course of Vegetation.** We see plants growing from the seed in spring-time, and gradually developing their parts: at length they blossom, bear fruit, and produce seeds like those from which they grew. Shall we commence the study of the plant with the full-grown herb or tree, adorned with flowers or laden with fruit? Or shall we commence with the seedling just rising from the ground? On the whole, we may get a clearer idea of the whole life and structure of plants if we begin at the beginning, that is, with the plantlet springing from the seed, and follow it throughout its course of growth. This also agrees best with the season in which the study of Botany is generally commenced, namely, in the spring of the year, when the growth of plants from the seed can hardly fail to attract attention. Indeed, it is this springing forth of vegetation from seeds and buds, after the rigors of our long winter, — clothing the earth's surface almost at once with a mantle of freshest verdure, — which gives to spring its greatest charm. Even the dullest beholder, the least observant of Nature at other seasons, can then hardly fail to ask: What are plants? How do they live and grow? What do they live upon? What is the object and use of vegetation in general, and of its particular and wonderfully various forms? These questions it is the object of the present Lessons to answer, as far as possible, in a simple way.

13. A reflecting as well as observing person, noticing the resemblances between one plant and another, might go on to inquire whether plants, with all their manifold diversities of form and appearance, are not all constructed on one and the same general plan. It will become apparent, as we proceed, that this is the case; — that one common plan may be discerned, which each particular plant, whether herb, shrub, or tree, has followed much more closely than would at first view be supposed. The differences, wide as they are, are merely incidental. What is true in a general way of any ordinary vegetable, will be found to be true of all, only with great variation in the details. In the same language, though in varied phrase, the hundred thousand kinds of plants repeat the same

story, — are the living witnesses and illustrations of one and the same plan of Creative Wisdom in the vegetable world. So that the study of any one plant, traced from the seed it springs from round to the seeds it produces, would illustrate the whole subject of vegetable life and growth. It matters little, therefore, what particular plant we begin with.

14. **The Germinating Plantlet.** Take for example a seedling Maple. Sugar Maples may be found in abundance in many places, starting from the seed (i. e. *germinating*) in early spring, and Red Maples at the beginning of summer, shortly after the fruits of the season have ripened and fallen to the ground. A pair of narrow green leaves raised on a tiny stem make up the whole plant at its first appearance (Fig. 4). Soon a root appears at the lower end of this stemlet; then a little bud at its upper end, between the pair of leaves, which soon grows into a second joint or stem bearing another pair of leaves, resembling the ordinary leaves of the Red Maple, which the first did not. Figures 5 and 6 represent these steps in the growth.

15. Was this plantlet formed in the seed at the time of germination, something as the chick is formed in the egg during the process of incubation? Or did it exist before in the seed, ready formed? To decide this question, we have only to inspect a sound seed, which in this instance requires no microscope, nor any other instrument than a sharp knife, by which the coats of the seed (previously soaked in water, if dry) may be laid open. We find within the seed, in this case, the little plantlet ready formed, and nothing else (Fig. 2); — namely, a pair of leaves like those of the earliest seedling (Fig. 4), only smaller, borne on a stemlet just like that of the seedling, only much shorter, and all snugly coiled up within the protecting seed-coat. The plant then exists beforehand in the seed, in miniature. It was not formed, but only devel-

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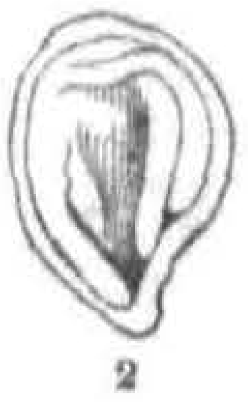
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FIG. 1. A winged fruit of Red Maple, with the seed-bearing portion cut open, to show the seed. 2. This seed cut open to show the embryo plantlet within, enlarged. 3. The embryo taken out whole, and partly unfolded. 4. The same after it has begun to grow; of the natural size.

oped, in germination; when it had merely to unfold and grow,—to elongate its rudimentary stem, which takes at the same time an upright position, so as to bring the leaf-bearing end into the light and air, where the two leaves expand; while from the opposite end, now pushed farther downwards into the soil, the root begins to grow. All this is true in the main of all plants that spring from real seeds, although with great diversity in the particulars. At least, there is hardly an exception to the fact, that *the plantlet exists ready formed in the seed*, in some shape or other.

16. The rudimentary plantlet contained in the seed is called an *Embryo*. Its little stem is named the *Radicle*, because it was supposed to be the root, when the difference between the root and stem was not so well known as now. It were better to name it the *Caulicle* (i. e. little stem); but it is not expedient to change old names. The seed-leaves it bears on its summit (here two in number) are technically called *Cotylèdons*. The little bud of undeveloped leaves which is to be found between the cotyledons before germination in many cases (as in the Pea, Bean, Fig. 17, &c.), has been named the *Plumule*.

17. In the Maple (Fig. 4), as also in the Morning-Glory (Fig. 28), and the like, this bud, or plumule, is not seen for some days after the seed-leaves are expanded. But soon it appears, in the Maple as a pair of minute leaves (Fig. 5), erelong raised on a stalk which carries them up to some distance above the cotyledons. The plantlet (Fig. 6) now consists, above ground, of two pairs of leaves, viz.: 1. the cotyledons or seed-leaves, borne on the summit of the original stemlet (the radicle); and 2. a pair of ordinary leaves, raised on a second joint of stem which has grown from the top of the first. Later, a third pair of leaves is formed, and raised on a third joint of stem, proceeding from the summit of the second (Fig. 7), just as that did from the first; and so on, until the germinating plantlet becomes a tree.

FIG. 5. Germinating Red Maple, which has produced its root beneath, and is developing a second pair of leaves above. 6. Same, further advanced.

18. So the youngest seedling, and even the embryo in the seed, is already an epitome of the herb or tree. It has a stem, from the lower end of which it strikes root: and it has leaves. The tree itself in its whole vegetation has nothing more in kind. To become a tree, the plantlet has only to repeat itself upwardly by producing more similar parts, — that is, new portions of stem, with new and larger leaves, in succession, — while beneath, it pushes its root deeper and deeper into the soil.

19. **The Opposite Growth of Root and Stem** began at the beginning of germination, and it continues through the whole life of the plant. While yet buried in the soil, and perhaps in total darkness, as soon as it begins to grow, the stem end of the embryo points towards the light, — curving or turning quite round if it happens to lie in some other direction, — and stretches upwards into the free air and sunshine; while the root end as uniformly avoids the light, bends in the opposite direction to do so if necessary, and ever seeks to bury itself more and more in the earth's bosom. How the plantlet makes these movements we cannot explain. But the object of this instinct is obvious. It places the plant from the first in the proper position, with its roots in the moist soil, from which they are to absorb nourishment, and its leaves in the light and air, where alone they can fulfil their office of digesting what the roots absorb.

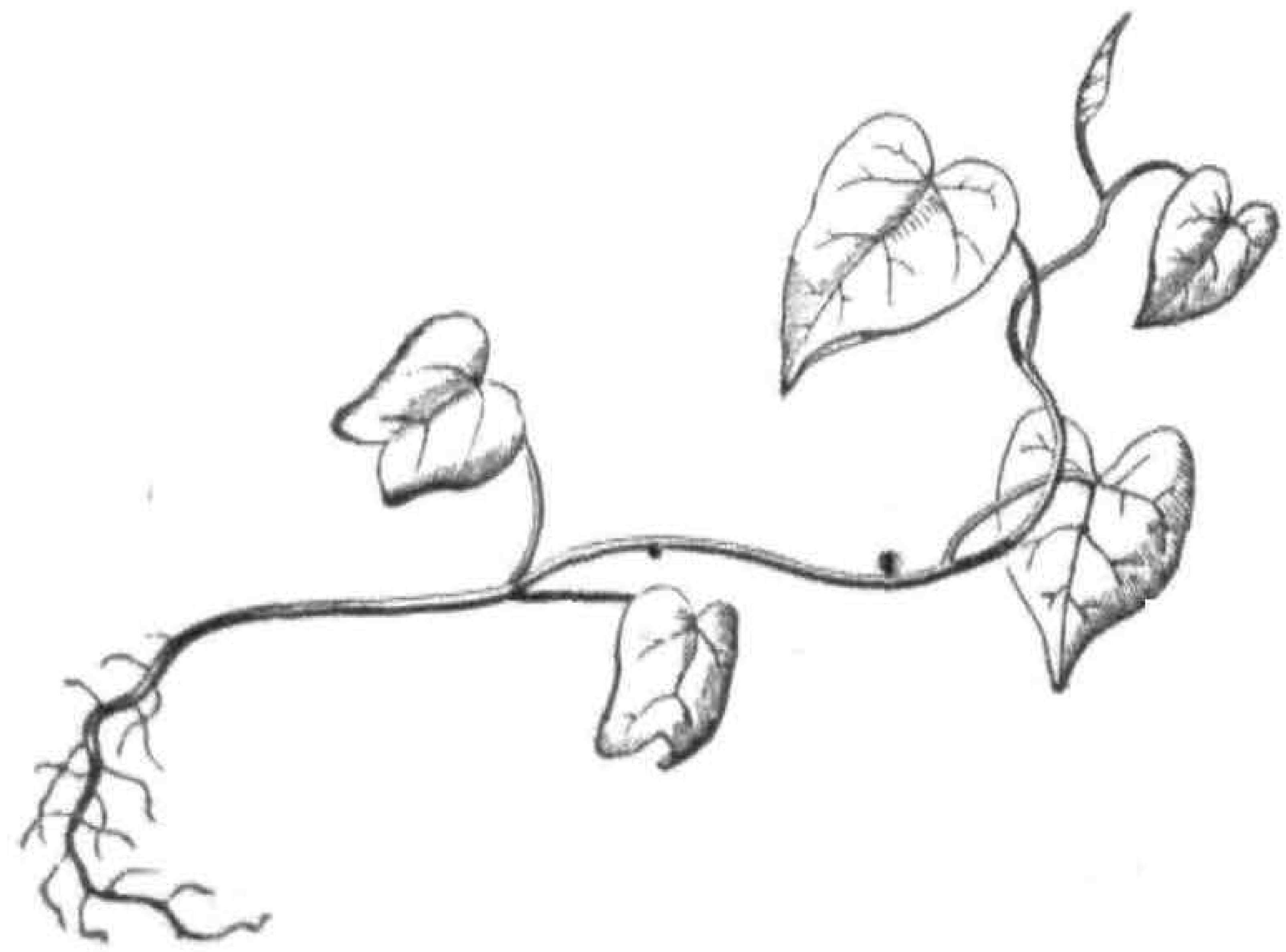
20. So the seedling plantlet finds itself provided with all the *organs of vegetation* that even the oldest plant possesses, — namely, root, stem and leaves; and has these placed in the situation where each is to act, — the root in the soil, the foliage in the light and air. Thus established, the plantlet has only to set about its proper work.

21. **The different Mode of Growth of Root and Stem** may also be here mentioned. Each grows, not only in a different direction, but in a different way. The stem grows by producing a set of joints, each from

FIG. 7. Germinating Red Maple, further developed.

the summit of its predecessor; and each joint elongates throughout every part, until it reaches its full length. The root is not composed of joints, and it lengthens only at the end. The stem in the embryo (viz. the radicle) has a certain length to begin with. In the pumpkin-seed, for instance (Fig. 9), it is less than an eighth of an inch long: but it grows in a few days to the length of one or two inches (Fig. 10), or still more, if the seed were deeper covered by the soil. It is by this elongation that the seed-leaves are raised out of the soil, so as to expand in the light and air. The length they acquire varies with the depth of the covering. When large and strong seeds are too deeply buried, the stemlet sometimes grows to the length of several inches in the endeavor to bring the seed-leaves to the surface. The lengthening of the succeeding joints of the stem serves to separate the leaves, or pairs of leaves, from one another, and to expose them more fully to the light.

22. The root, on the other hand, begins by a new formation at the base of the embryo stem; and it continues to increase in length solely by additions to the extremity, the parts once formed scarcely elongating at all afterwards. This mode of growth is well adapted to the circumstances in which roots are placed, leaving every part undisturbed in the soil where it was formed, while the ever-advancing points readily insinuate themselves into the crevices or looser portions of the soil, or pass around the surface of solid obstacles.



LESSON III.

GROWTH OF THE PLANT FROM THE SEED.— *Continued.*

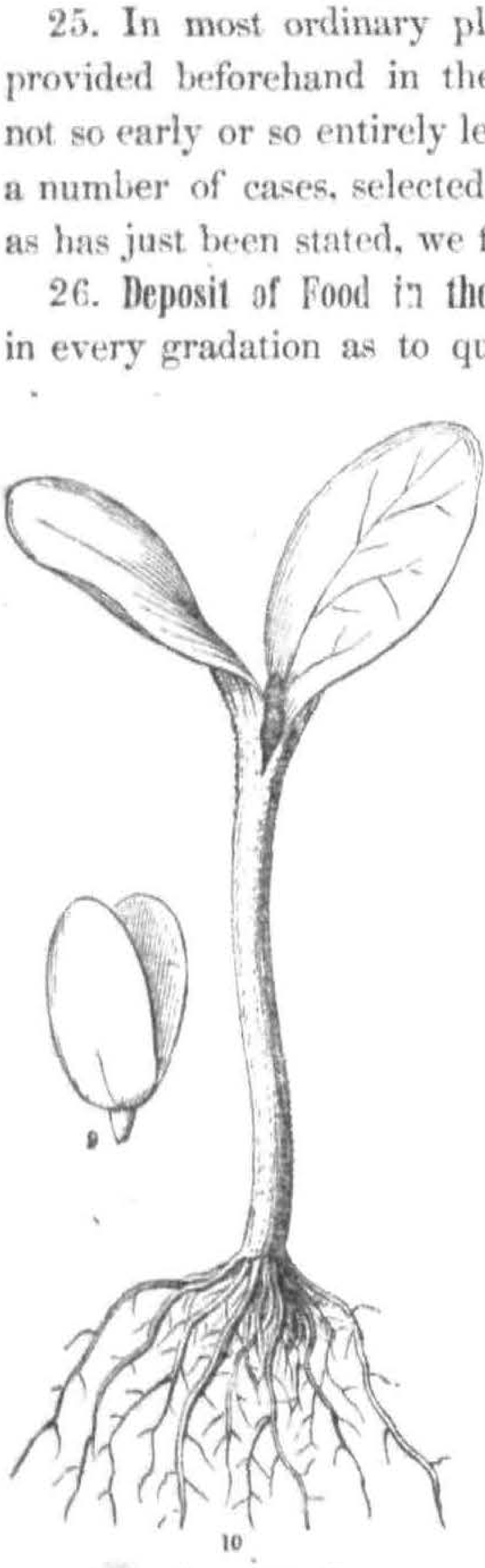
23. So a plant consists of two parts, growing in a different manner. as well as in opposite directions. One part, the root, grows downwards into the soil: it may, therefore, be called the *descending axis.* The other grows upwards into the light and air: it may be called the *ascending axis.* The root grows on continuously from the extremity, and so does not consist of joints, nor does it bear leaves, or anything of the kind. The stem grows by a succession of joints, each bearing one or more leaves on its summit. Root on the one hand, and stem with its foliage on the other, make up the whole plantlet as it springs from the seed; and the full-grown herb, shrub, or tree has nothing more in kind, — only more in size and number. Before we trace the plantlet into the herb or tree, some other cases of the growth of the plantlet from the seed should be studied, that we may observe how the same plan is worked out under a variety of forms, with certain differences in the details. The materials for this study are always at hand. We have only to notice what takes place all around us in spring, or to plant some common seeds in pots, keep them warm and moist, and watch their germination.

24. **The Germinating Plantlet feeds on Nourishment provided beforehand.** The embryo so snugly ensconced in the seed of the Maple (Fig. 2, 3, 4) has from the first a miniature stem, and a pair of leaves already green, or which become green as soon as brought to the light. It has only to form a root by which to fix itself to the ground, when it becomes a perfect though diminutive vegetable, capable of providing for itself. This root can be formed only out of proper material: neither water nor anything else which the plantlet is imbibing from the earth will answer the purpose. The proper material is nourishing matter, or prepared food, more or less of which is always provided by the parent plant, and stored up in the seed, either *in* the embryo itself, or *around* it. In the Maple, this nourishment is stored up in the thickish cotyledons, or seed-leaves. And there is barely enough of it to make the beginning of a root, and to provide for the lengthening of the stemlet so as to bring up the unfolding seed-leaves where they may expand to the light of day. But when this is done,

the tiny plant is already able to shift for itself; — that is, to live and continue its growth on what it now takes from the soil and from the air, and *elaborates into nourishment* in its two green leaves, under the influence of the light of the sun.

25. In most ordinary plants, a larger portion of nourishment is provided beforehand in the seed; and the plantlet consequently is not so early or so entirely left to its own resources. Let us examine a number of cases, selected from very common plants. Sometimes, as has just been stated, we find this

26. **Deposit of Food in the Embryo itself.** And we may observe it in every gradation as to quantity, from the Maple of our first illustration, where there is very little, up to the Pea and the Horsechestnut, where there is as much as there possibly can be. If we strip off the coats from the large and flat seed of a Squash or Pumpkin, we find nothing but the embryo within (Fig. 9); and almost the whole bulk of this consists of the two seed-leaves. That these contain a good supply of nourishing matter, is evident from their sweet taste and from their thickness, although there is not enough to obscure their leaf-like appearance. It is by feeding on this supply of nourishment that the germinating Squash or Pumpkin (Fig. 10) grows so rapidly and so vigorously from the seed, — lengthening its stemlet to more than twenty times the length it had in the seed, and thickening it in proportion, — sending out at once a number of roots from its lower end, and soon developing the plumule (16) from its upper end into a third leaf: meanwhile the two cotyledons, relieved from the nourishment with which their tissue was gorged, have expanded into useful green leaves.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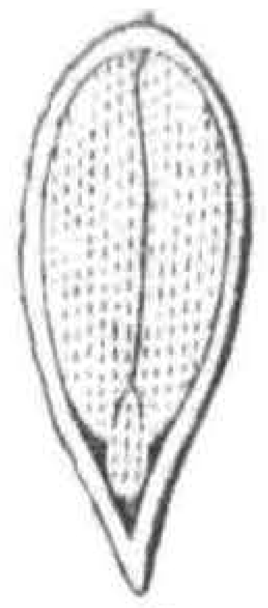
27. For a stronger instance, take next the seed of a Plum or Peach, or an Almond, or an Apple-seed (Fig. 11, 12), which shows

FIG. 9. Embryo of a Pumpkin, of the natural size; the cotyledons a little opened
10. The same, when it has germinated.

the same thing on a smaller scale. The embryo, which here also makes up the whole bulk of the kernel of the seed, differs from that of the Pumpkin only in having the seed-leaves more thickened, by the much larger quantity of nourishment stored up in their tissue, — so large and so pure indeed, that the almond becomes an article of food. Fed by this abundant supply, the second, and even the third joints of the stem, with their leaves, shoot forth as soon as the stemlet comes to the surface of the soil. The Beech-nut (Fig. 13), with its sweet and eatable kernel, consisting mainly of a pair of seed-leaves folded together, and gorged with nourishing matter, offers another instance of the same sort: this ample store to feed upon enables the germinating plantlet to grow with remarkable vigor, and to *develop a second joint of stem, with its* pair of leaves (Fig. 14), before the first pair has expanded or the root has obtained much foothold in the soil.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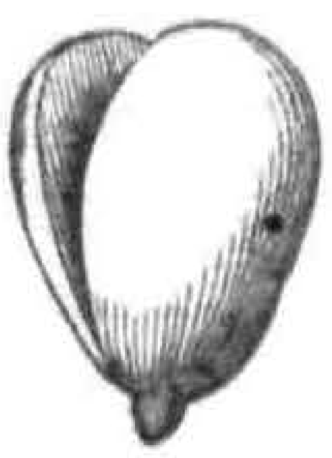
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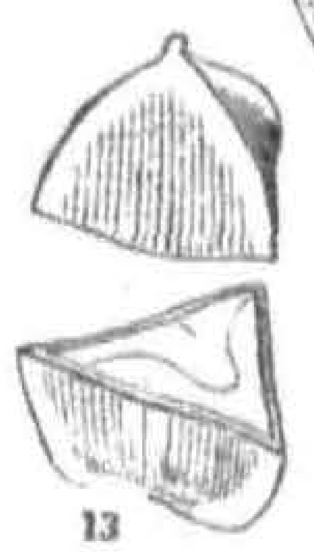
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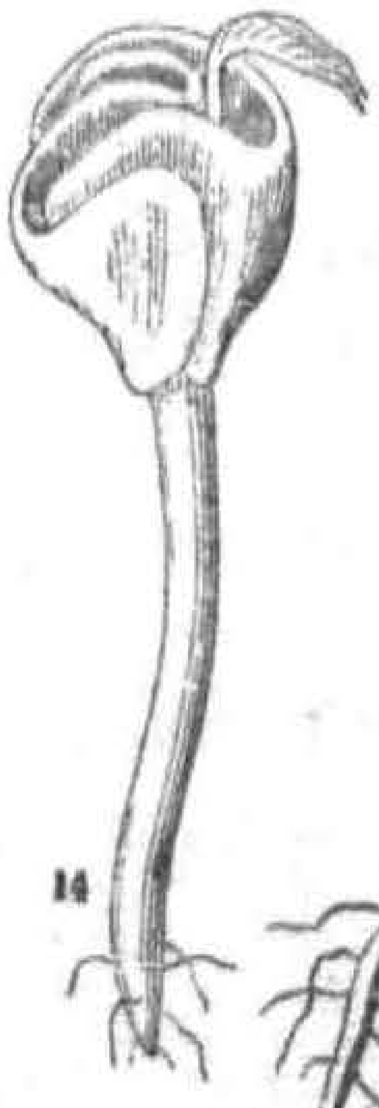
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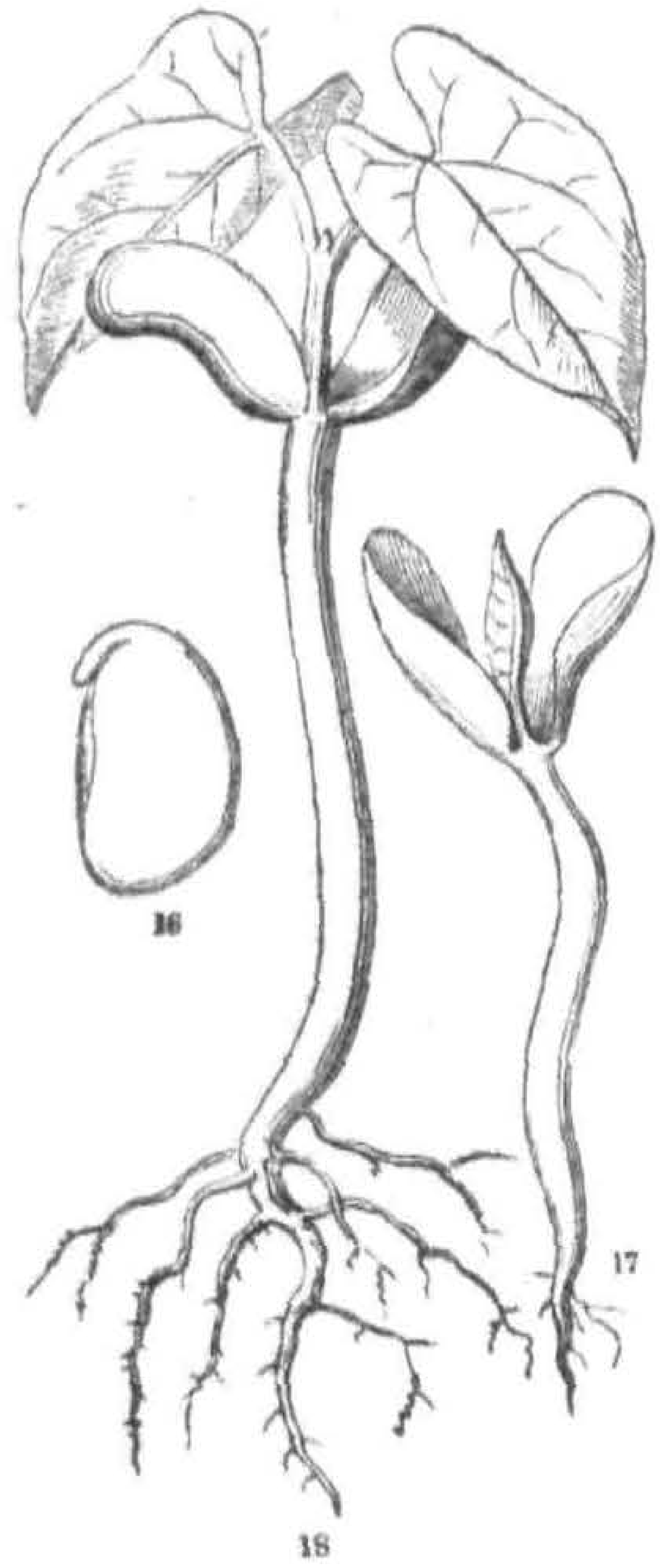
28. A Bean affords a similar and more familiar illustration. Here the cotyledons in the seed (Fig. 16) are so thick, that, although they are raised out of ground in the ordinary way in germination (Fig. 17), and turn greenish, yet they never succeed in becoming leaf-like, — never display their real nature of leaves, as they do so plainly in the Maple (Fig. 5), the Pumpkin (Fig. 10), the Morning-Glory (Fig. 8, 26 – 28), &c. Turned to great account as magazines of food for the germinating plantlet, they fulfil this special office admirably, but

FIG. 11. An Apple-seed cut through lengthwise, showing the embryo with its thickened cotyledons. 12. The embryo of the Apple, taken out whole, its cotyledons partly separated.

FIG. 13. A Beech-nut, cut across. 14. Beginning germination of the Beech, showing the plumule growing before the cotyledons have opened or the root has scarcely formed. 15. The same, a little later, with the second joint lengthened.

they were so gorged and, as it were, misshapen, that they became quite unfitted to perform the office of foliage. This office is accordingly first performed by the succeeding pair of leaves, those of the plumule (Fig. 17, 18), which is put into rapid growth by the abundant nourishment contained in the large and thick seed-leaves. The latter, having fulfilled this office, soon wither and fall away.



29. This is carried a step farther in the Pea (Fig. 19, 20), a near relative of the Bean, and in the Oak (Fig. 21, 22), a near relative of the Beech. The difference in these and many other similar cases is this. The cotyledons, which make up nearly the whole bulk of the seed are excessively thickened, so as to become nearly hemispherical in shape. They have lost all likeness to leaves, and all power of ever fulfilling the office of leaves. Accordingly in germination they remain unchanged within the husk or coats of the seed, never growing themselves, but supplying abundant nourishment to the plumule (the bud for the forming stem) between them. This pushes forth from the seed, shoots upward, and gives rise

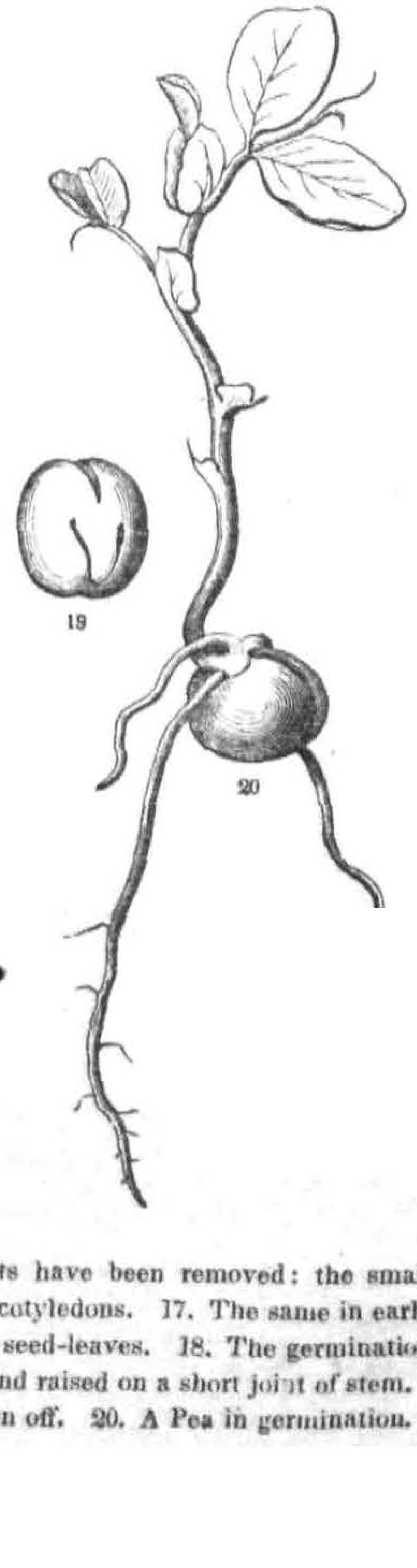
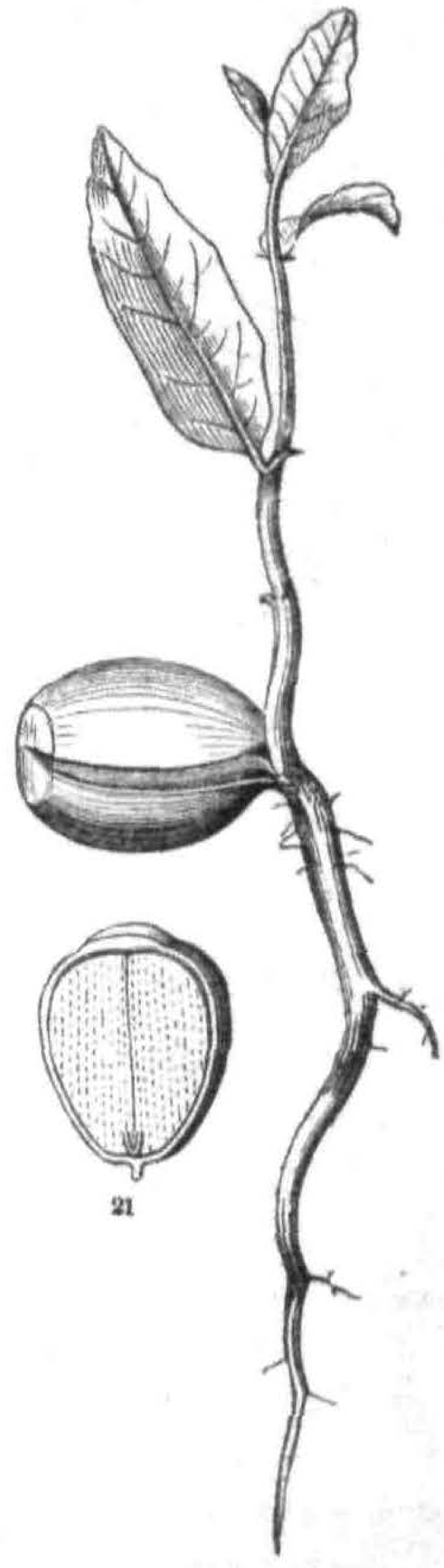


FIG. 16. A Bean: the embryo, from which seed-coats have been removed: the small stem is seen above, bent down upon the edge of the thick cotyledons. 17. The same in early germination; the plumule growing from between the two seed-leaves. 18. The germination more advanced, the two leaves of the plumule unfolded, and raised on a short joint of stem.

FIG. 19. A Pea: the embryo, with the seed-coats taken off. 20. A Pea in germination.

to the first leaves that appear. In most cases of the sort, the radicle, or short original stemlet of the embryo below the cotyledons (which is plainly shown in the Pea, Fig. 19), lengthens very little, or not at all; and so the cotyledons remain under ground, if the seed was covered by the soil, as every one knows to be the case with Peas. In these (Fig. 20), as also in the Oak (Fig. 22), the leaves of the first one or two joints are imperfect, and mere small scales; but *genuine leaves immediately follow*. The Horsechestnut and Buckeye (Fig. 23, 24) furnish another instance of the same sort. These trees are nearly related to the Maple; but while the seed-leaves of the Maple show themselves to be leaves, even in the seed (as we have already seen), and when they germinate fulfil the office of ordinary leaves, those of the Buckeye and of the Horsechestnut (Fig. 23), would never be suspected to be the same organs. Yet they are so, only in another shape, — exceedingly thickened by the accumulation of a great quantity of starch and other nourishing matter in their substance; and besides, their contiguous faces stick together more or less firmly, so that they never open. But the stalks of these seed-leaves grow, and, as they lengthen, push the radicle and the plumule out of the seed, when the former develops downwardly the root, the latter upwardly the leafy stem and all it bears (Fig. 24).



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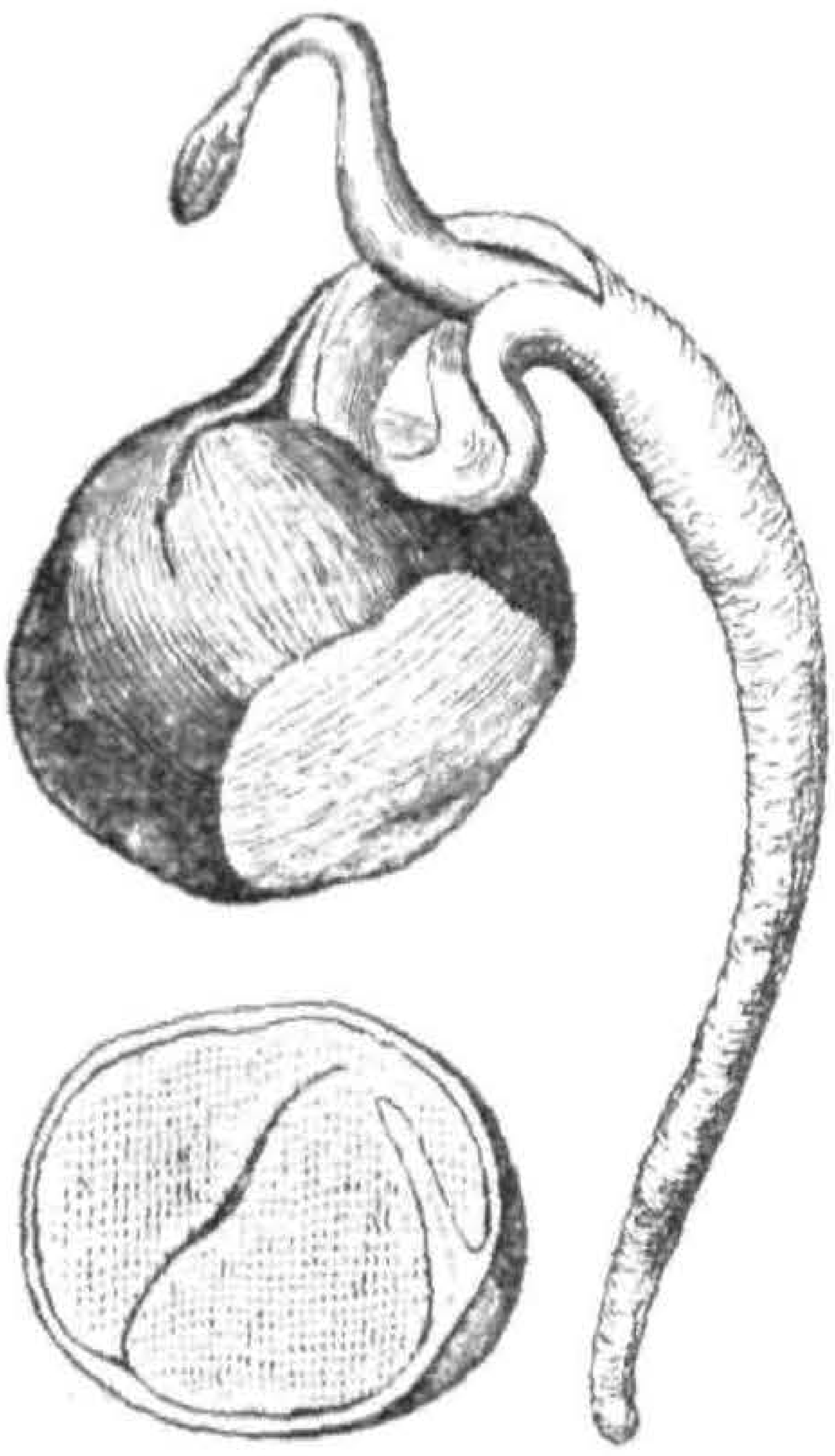
30. Deposit of Food outside of the Embryo. Very often the nourishment provided for the seedling plantlet is laid up, not *in* the embryo itself, but *around* it. A good instance to begin with is furnished by the common Morning-Glory, or Convolvulus. The embryo, taken out of the seed and straightened, is shown in Fig. 26. It consists of a short stemlet and of a pair of very thin and delicate green leaves, having no stock of nourishment in them for sustaining the

FIG. 21. An acorn divided lengthwise. 22. The germinating Oak.

earliest growth. On cutting open the seed, however, we find this embryo (considerably crumpled or folded together, so as to occupy less space, Fig. 25) to be surrounded by a mass of rich, mucilaginous matter (becoming rather hard and solid when dry), which forms the principal bulk of the seed. Upon this stock the embryo feeds in germination; the seed-leaves absorbing it into their tissue as it is rendered soluble (through certain chemical changes) and dissolved by the water which the germinating seed imbibes from the moist soil. Having by this aid lengthened its radicle into a stem of considerable length,



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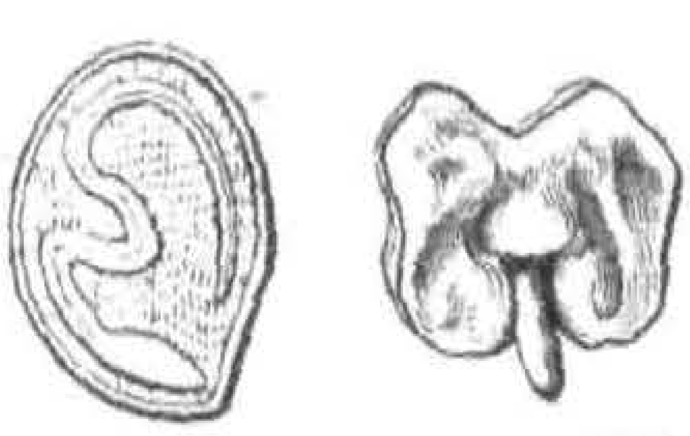

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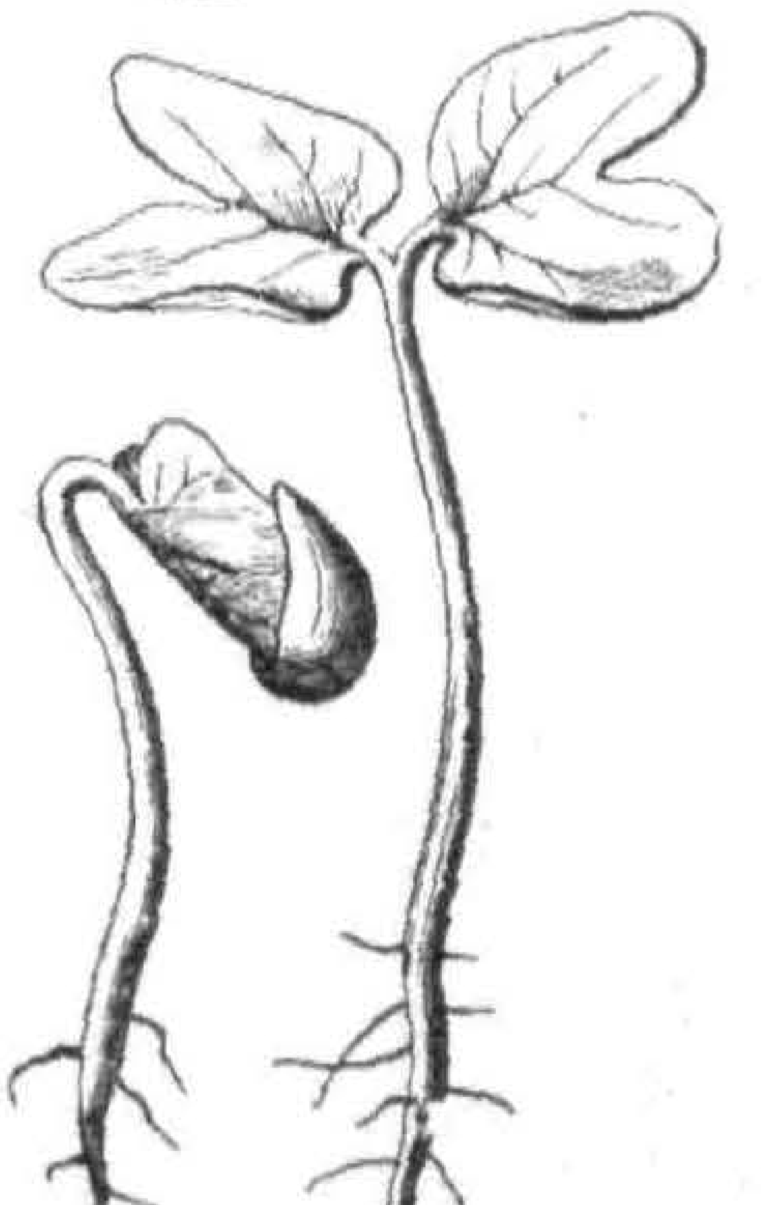
and formed the beginning of a root at its lower end, already imbedded in the soil (Fig. 27), the cotyledons now disengage hemselves from the seed-coats, and ex- ›and in the light as the first pair of leaves Fig. 28). These immediately begin to laborate, under the sun's influence, what ıe root imbibes from the soil, and the new ɔurishment so produced is used, partly to ıcrease the size of the little stem, root, ıd leaves already existing, and partly to ·oduce a second joint of stem with its ıf (Fig. 29), then a third with its leaf 'ig. 8); and so on.



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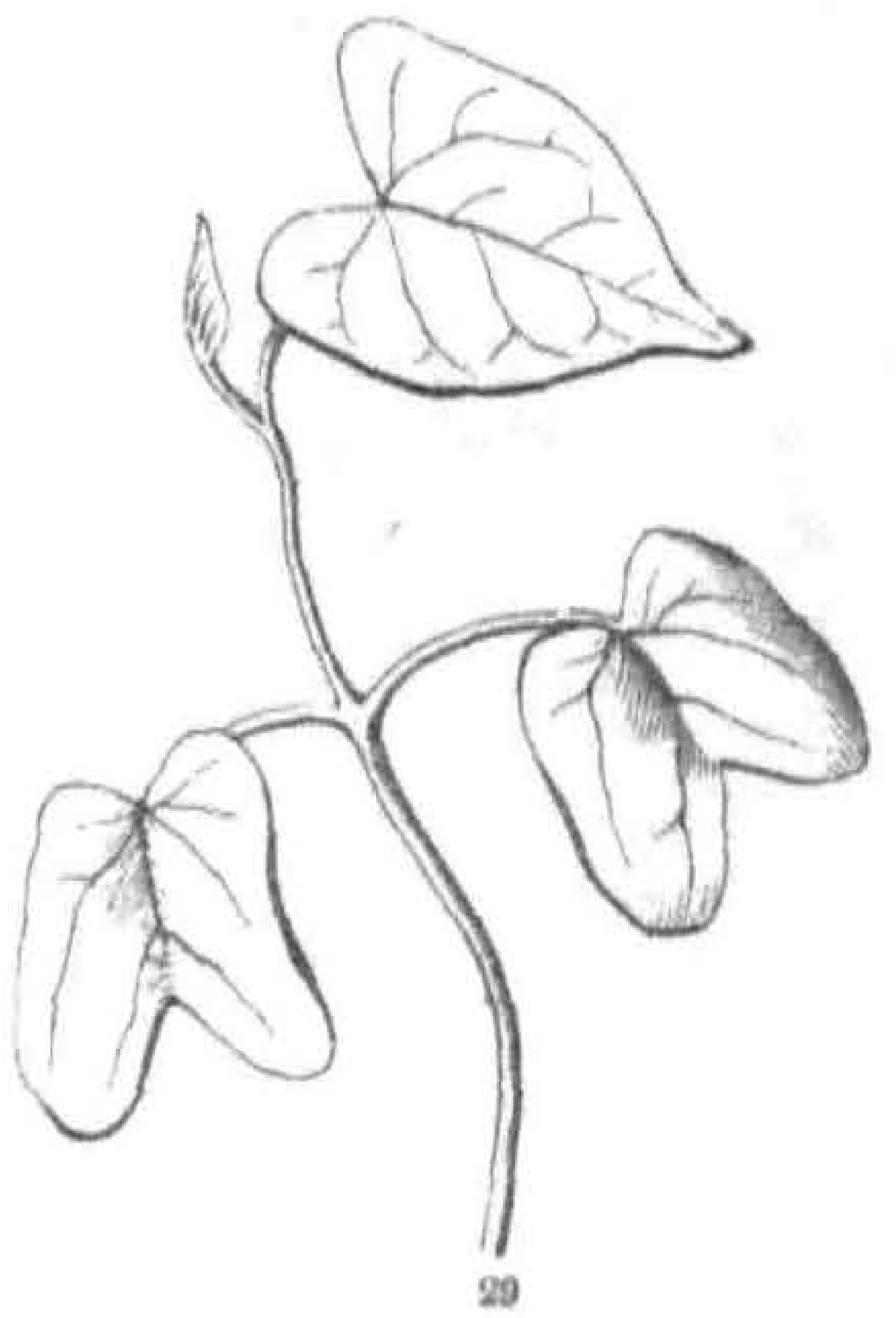
31. This maternal store of food, deposited in the seed along with ı embryo (but not in its substance), the old botanists likened to

'G. 23. Buckeye: a seed divided. 24. A similar seed in gemination.
G. 25. Seed and embryo of Morning-Glory, cut across. 26. Embryo of the same, de- ·d and straightened. 27. Germinating Morning-Glory. 28. The same further advanced; ro thin seed-leaves expanded.

the *albumen*, or white of the egg, which encloses the yolk, and therefore gave it the same name,—the *albumen* of the seed,—a name which it still retains. Food of this sort for the plant is also food for animals, or for man; and it is this albumen, the floury part of the seed, which forms the principal bulk of such important grains as those of Indian Corn (Fig. 38 – 40), Wheat, Rice, Buckwheat, and of the seed of Four-o'clock, (Fig. 36, 37), and the like. In all these last-named cases, it may be observed that the embryo is not enclosed in the albumen, but placed on one side of it, yet in close contact with it, so that the embryo may absorb readily from it the nourishment it requires when it begins to grow. Sometimes the embryo is coiled around the outside, in the form of a ring, as in the Purslane and the Four-o'clock (Fig. 36, 37); sometimes it is coiled within the albumen, as in the Potato (Fig. 34, 35); sometimes it is straight in the centre of the albumen, occupying nearly its whole length, as in the Barberry (Fig. 32, 33), or much smaller and near one end, as in the Iris (Fig. 43); or sometimes so minute, in the midst of the albumen, that it needs a magnifying-glass to find it, as in the But-



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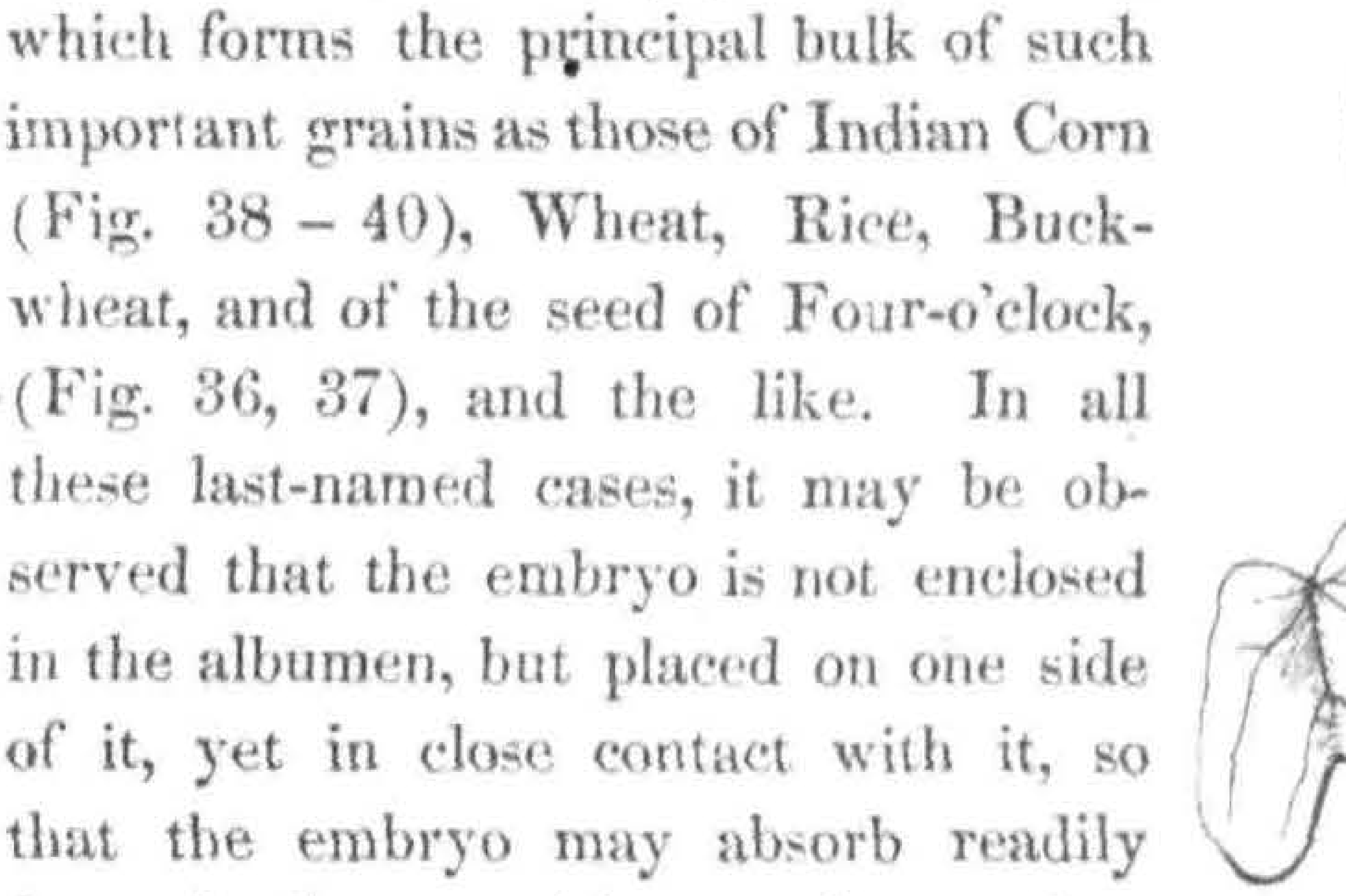

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FIG. 29. Germination of the Morning Glory more advanced: the upper part only; showing the leafy cotyledons, the second joint of stem with its leaf, and the third with its leaf just developing.

FIG. 30. Section of a seed of a Peony, showing a very small embryo in the albumen, near one end. 31. This embryo detached, and more magnified.

FIG. 32. Section of a seed of Barberry, showing the straight embryo in the middle of the albumen. 33. Its embryo detached.

FIG. 34. Section of a Potato-seed, showing the embryo coiled in the albumen. 35. Its embryo detached.

FIG. 36. Section of the seed of Four-o'clock, showing the embryo coiled round the outside of the albumen. 37. Its embryo detached.

tercup or the Columbine, and in the Peony (Fig. 30, 31), where, however, it is large enough to be distinguished by the naked eye. Nothing is more curious than the various shapes and positions of the embryo in the seed, nor more interesting than to watch its development in germination. One point is still to be noticed, since the botanist considers it of much importance, namely: —

32. **The Kinds of Embryo as to the Number of Cotyledons.** In all the figures, it is easy to see that the embryo, however various in shape, is constructed on one and the same plan; — it consists of a radicle or stemlet, with a pair of cotyledons on its summit. Botanists therefore call it *dicotyledonous*, — an inconveniently long word to express the fact that the embryo has two cotyledons or seed-leaves. In many cases (as in the Buttercup), the cotyledons are indeed so minute, that they are discerned only by the nick in the upper end of the little embryo; yet in germination they grow into a pair of seed-leaves, just as in other cases where they are plain to be seen, as leaves, in the seed. But in Indian Corn (Fig. 40), in Wheat, the Onion, the Iris (Fig. 43), &c., it is well known that only one leaf appears at first from the sprouting seed: in these the embryo has only one cotyledon, and it is therefore termed by the botanists *monocotyledonous*; — an extremely long word, like the other, of Greek derivation, which means *one-cotyledoned.* The rudiments of one or more other leaves are, indeed, commonly present in this sort of embryo, as is plain to see in Indian Corn (Fig. 38 – 40), but they form a bud situated above or within the cotyledon, and enclosed by it more or less completely; so that they evidently belong to the plumule (16); and these leaves appear in the seedling plantlet, each from within its predecessor, and therefore originating higher up on the forming stem (Fig. 42, 44). This will readily be understood from the accompanying figures, with their explanation, which the student may without difficulty verify for him-

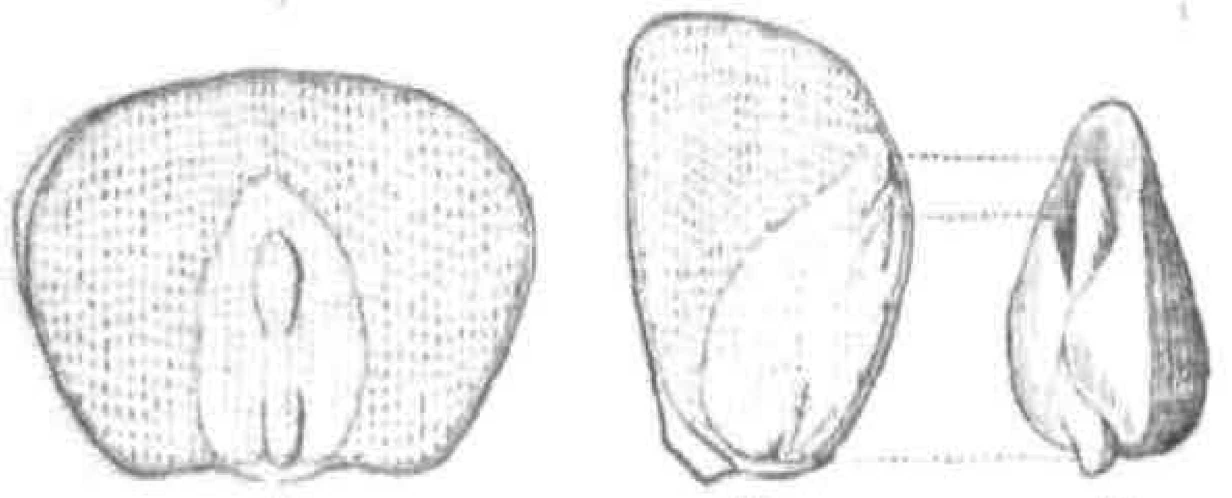
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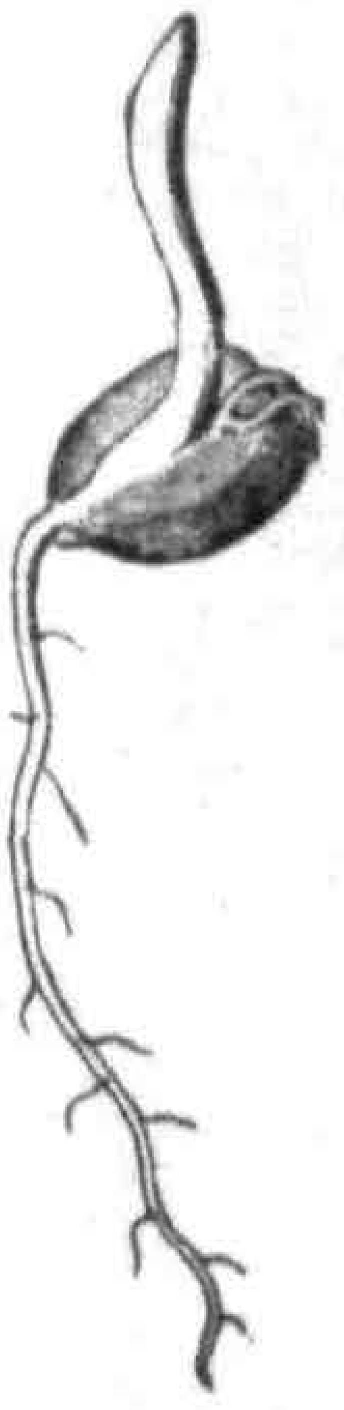
FIG. 38. A grain of Indian Corn, flatwise, cut away a little, so as to show the embryo, lying on the albumen, which makes the principal bulk of the seed.

FIG. 39. Another grain of Corn, cut through the middle in the opposite direction, dividing the embryo through its thick cotyledon and its plumule, the latter consisting of two leaves, one enclosing the other.

FIG. 40. The embryo of Corn, taken out whole: the thick mass is the cotyledon; the narrow body partly enclosed by it is the plumule; the little projection at its base is the very short radicle enclosed in the sheathing base of the first leaf of the plumule.

self, and should do so, by examining grains of Indian Corn, soaked in water, before and also during germination. In the Onion, Lily, and the Iris (Fig. 43), the monocotyledonous embryo is simpler, consisting apparently of a simple oblong or cylindrical body, in which no distinction of parts is visible: the lower end is *radicle*, and from it grows the root; the rest is a *cotyledon*, which has wrapped up in it a minute *plumule*, or bud, that shows itself when the seeds sprout in germination. The first leaf which appears above ground in all these cases is not the cotyledon. In all seeds with one cotyledon to the embryo, this remains in the seed, or at least its upper part, while its lengthening base comes out, so as to extricate the plumule, which shoots upward, and develops the first leaves of the plantlet. These appear one above or within the other in succession, — as is shown in Fig. 42 and Fig. 44, — the first commonly in the form of a little scale or imperfect leaf; the second or third and the following ones as the real, ordinary leaves of the plant. Meanwhile, from the root end of the embryo, a root (Fig. 41, 44), or soon a whole *cluster of roots* (Fig. 42), makes its appearance.



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33. In Pines, and the like, the embryo consists of a radicle or stemlet, bearing on its summit three or four, or often from five to ten slender cotyledons, arranged in a circle (Fig. 45), and expanding at once into a circle of as many green leaves in germination (Fig. 46). Such embryos are said to be *polycotyledonous*, that is, as the word denotes, many-cotyledoned.

42

34. Plan of Vegetation. The student who has understandingly followed the growth of the embryo in the seed into the seedling plantlet, — composed of a root, and a stem of two or three joints, each bearing a

FIG. 41. Grain of Indian Corn in germination.
FIG. 42. The same, further advanced

LESSON IV.

THE GROWTH OF PLANTS FROM BUDS AND BRANCHES.

37. WE have seen how the plant grows so as to produce a root, and a simple stem with its foliage. Both the root and stem, however, generally branch.

38. The branches of the root arise without any particular order. There is no telling beforehand from what part of a main root they will spring. But the branches of the stem, except in some extraordinary cases, regularly arise from a particular place. Branches or shoots in their undeveloped state are

39. **Buds.** These regularly appear in the *axils* of the leaves, — that is, in the angle formed by the leaf with the stem on the upper side; and as leaves are symmetrically arranged on the stem, the buds, and the branches into which the buds grow, necessarily partake of this symmetry.

40. We do not confine the name of bud to the scaly winter-buds which are so conspicuous on most of our shrubs and trees in winter and spring. It belongs as well to the forming branch of any herb, at its first appearance in the axil of a leaf. In growing, buds lengthen into branches, just as the original stem did from the plumule of the embryo (16) when the seed germinated. Only, while the original stem is implanted in the ground by its root, the branch is implanted on the stem. Branches, therefore, are repetitions of the main stem. They consist of the same parts, — namely, joints of stem and leaves, — growing in the same way And in the axils of their leaves another crop of buds is naturally produced, giving rise to another generation of branches, which may in turn produce still another generation; and so on, — until the tiny and simple seedling develops into a tall and spreading herb or shrub; or into a massive tree, with its hundreds of annually increasing branches, and its thousands, perhaps millions, of leaves.

41. The herb and the tree grow in the same way. The difference is only in size and duration.

An *Herb* dies altogether, or dies down to the ground, after it has ripened its fruit, or at the approach of winter.

An *annual herb* flowers in the first year, and dies, root and all, after ripening its seed: Mustard, Peppergrass, Buckwheat, &c., are examples.

A *biennial herb* — such as the Turnip, Carrot, Beet, and Cabbage — grows the first season without blossoming, survives the winter, flowers after that, and dies, root and all, when it has ripened its seed.

A *perennial herb* lives and blossoms year after year, but dies down to the ground, or near it, annually, — not, however, quite down to the root: for a portion of the stem, with its buds, still survives; and from these buds the shoots of the following year arise.

A *Shrub* is a perennial plant, with woody stems which continue alive and grow year after year.

A *Tree* differs from a shrub only in its greater size.

42. **The Terminal Bud.** There are herbs, shrubs, and trees which do not branch, as we have already seen (35); but whose stems, even when they live for many years, rise as a simple shaft (Fig. 47). These plants grow by the continued evolution of a bud which crowns the summit of the stem, and which is therefore called the *terminal bud.* This bud is very conspicuous in many branching plants also; as on all the stems or shoots of Maples (Fig. 53), Horsechestnuts (Fig. 48), or Hickories (Fig. 49), of a year old. When they grow, they merely prolong the shoot or stem on which they rest. On these same shoots, however, other buds are to be seen, regularly arranged down their sides. We find them situated just over broad, flattened places, which are the scars left by the fall of the leaf-stalk the autumn previous. Before the fall of the leaf, they would have been seen to occupy their *axils* (39): so they are named

43. **Axillary Buds.** They were formed in these trees early in the summer. Occasionally they grow at the time into branches: at least, some of them are pretty sure to do so, in case the growing terminal bud at the end of the shoot is injured or destroyed. Otherwise they lie dormant until the spring. In many trees or shrubs (such for example as the Sumach and Honey-Locust) these axillary buds do not show themselves until spring; but if

48

FIG. 48. Shoot of Horsechestnut, of one year's growth, taken in autumn after the leaves have fallen.

searched for, they may be detected, though of small size, hidden under the bark. Sometimes, although early formed, they are concealed all summer long under the base of the leaf-stalk, hollowed out into a sort of inverted cup, like a candle-extinguisher, to cover them; as in the Locust, the Yellow-wood, or more strikingly in the Buttonwood or Plane-tree (Fig. 50).

44. Such large and conspicuous buds as those of the Horsechestnut, Hickory, and the like, are *scaly;* the scales being a kind of imperfect leaves. The use of the bud-scales is obvious; namely, to protect the tender young parts beneath. To do this more effectually, they are often coated on the outside with a varnish which is impervious to wet, while within they, or the parts they enclose, are thickly clothed with down or wool; not really to keep out the cold of winter, which will of course penetrate the bud in time, but to shield the interior against sudden changes from warm to cold, or from cold to warm, which are equally injurious. Scaly buds commonly belong, as would be expected, to trees and shrubs of northern climates; while *naked* buds are usual in tropical regions, as well as in herbs everywhere which branch during the summer's growth and do not endure the winter.

49

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45. But *naked buds*, or nearly naked, also occur in several of our own trees and shrubs; sometimes pretty large ones, as those of Hob

FIG. 49. Annual shoot of the Shagbark Hickory.
FIG. 50. Bud and leaf of the Buttonwood, or American Plane-tree.

blebush (while those of the nearly-related Snowball or High Bush-Cranberry are scaly); but more commonly, when naked buds occur in trees and shrubs of our climate, they are small, and sunk in the bark, as in the Sumac; or even partly buried in the wood until they begin to grow, as in the Honey-Locust.

46. **Vigor of Vegetation from Buds.** Large and strong buds, like those of the Horsechestnut, Hickory, and the like, on inspection will be found to contain several leaves, or pairs of leaves, ready formed, folded and packed away in small compass, just as the seed-leaves are packed away in the seed: they even contain all the blossoms of the ensuing season, plainly visible as small buds. And the stems upon which these buds rest are filled with abundant nourishment, which was deposited the summer before in the wood or in the bark. Under the surface of the soil, or on it, covered with the fallen leaves of autumn, we may find similar strong buds of our perennial herbs, in great variety; while beneath are thick roots, rootstocks, or tubers, charged with a great store of nourishment for their use. As we regard these, we shall readily perceive how it is that vegetation shoots forth so vigorously in the spring of the year, and clothes the bare and lately frozen surface of the soil, as well as the naked boughs of trees, almost at once with a covering of the freshest green, and often with brilliant blossoms. Everything was prepared, and even formed, beforehand: the short joints of stem in the bud have only to lengthen, and to separate the leaves from each other so that they may unfold and grow. Only a small part of the vegetation of the season comes directly from the seed, and none of the earliest vernal vegetation. This is all from buds which have lived through the winter.

47. This growth from buds, in manifold variety, is as interesting a subject of study as the growth of the plantlet from the seed, and is still easier to observe. We have only room here to sketch the general plan; earnestly recommending the student to examine attentively their mode of growth in all the common trees and shrubs, when they shoot forth in spring. The growth of the terminal bud prolongs the stem or branch: the growth of axillary buds produces branches.

48. **The Arrangement of Branches** is accordingly the same as of axillary buds; and the arrangement of these buds is the same as that of the leaves. Now leaves are arranged in two principal ways: they are either *opposite* or *alternate*. Leaves are *opposite* when

familiar illustrations (Fig. 54); but some other trees with strong terminal buds exhibit the same character for a certain time, and in a less marked degree.

57. **Latent Buds.** Some of the axillary buds grow the following year into branches; but a larger number do not (51). These do not necessarily die. Often they survive in a latent state for some years, visible on the surface of the branch, or are smaller and concealed under the bark, resting on the surface of the wood: and when at any time the other buds or branches happen to be killed, these older latent buds grow to supply their place; — as is often seen when the foliage and young shoots of a tree are destroyed by insects. The new shoots seen springing directly out of large stems may sometimes originate from such latent buds, which have preserved their life for years. But commonly these arise from

58. **Adventitious Buds.** These are buds which certain shrubs and trees produce anywhere on the surface of the wood, especially where it has been injured. They give rise to the slender twigs which often feather so beautifully the sides of great branches or trunks of our American Elms. They sometimes form on the root, which naturally is destitute of buds; and they are sure to appear on the trunks and roots of Willows, Poplars, and Chestnuts, when these are wounded or mutilated. Indeed Osier-Willows are *pollarded*, or cut off, from time to time, by the cultivator, for the purpose of producing a crop of slender adventitious twigs, suitable for basket-work. Such branches, being altogether irregular, of course interfere with the natural symmetry of the tree (50). Another cause of irregularity, in certain trees and shrubs, is the formation of what are called

59. **Accessory or Supernumerary Buds.** There are cases where two, three, or more buds spring from the axil of a leaf, instead of the single one which is ordinarily found there. Sometimes they are placed one over the other, as in the Aristolochia or Pipe-Vine, and in the Tartarian Honeysuckle (Fig. 51); also in the Honey-Locust, and in the Walnut and Butternut (Fig. 52), where the upper supernumerary bud is a good way out of the axil and above the others. And this is here stronger

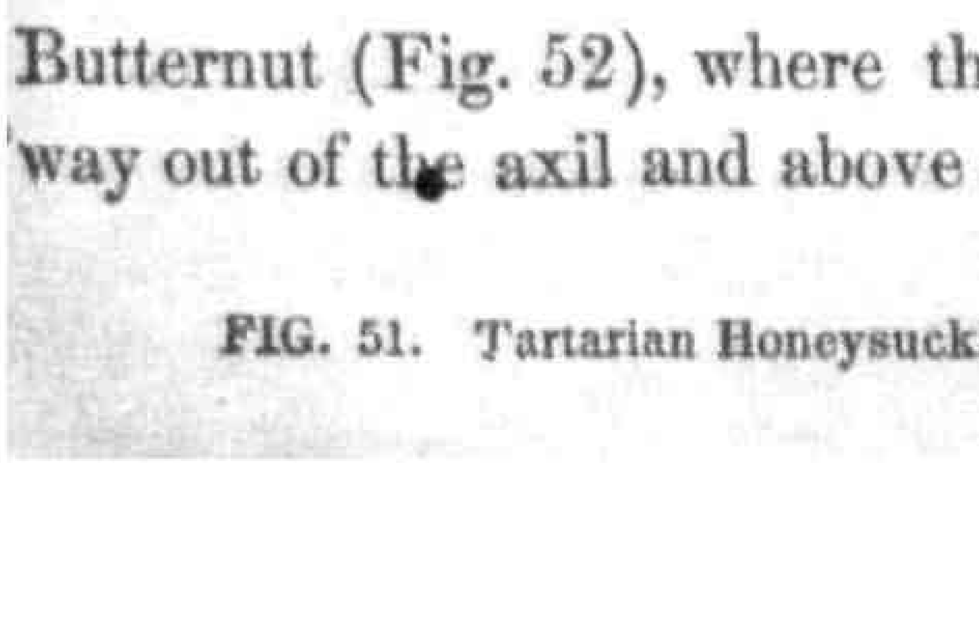

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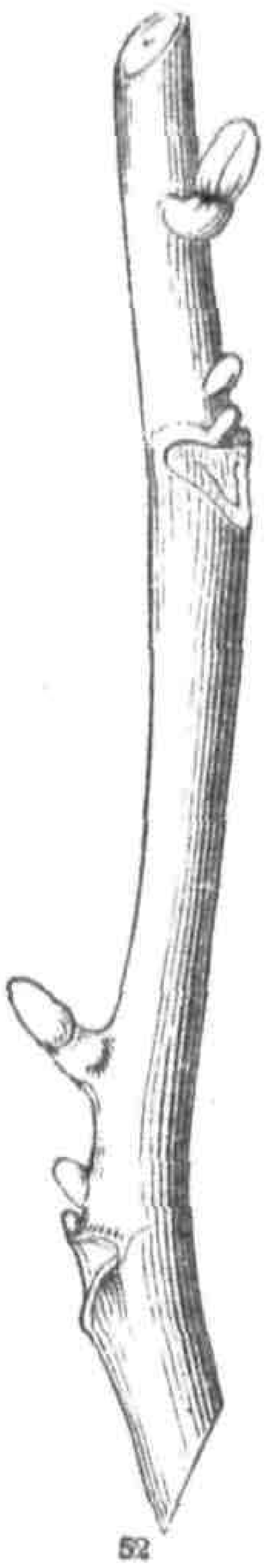
FIG. 51. Tartarian Honeysuckle, with three accessory buds in one axil.

than the others, and grows into a branch which is considerably out of the axil, while the lower and smaller ones commonly do not grow at all. In other cases the three buds stand side by side in the axil, as in the Hawthorn, and the Red Maple (Fig. 53). If these were all to grow into branches, they would stifle or jostle each other. But some of them are commonly flower-buds: in the Red Maple, only the middle one is a leaf-bud, and it does not grow until after those on each side of it have expanded the blossoms they contain.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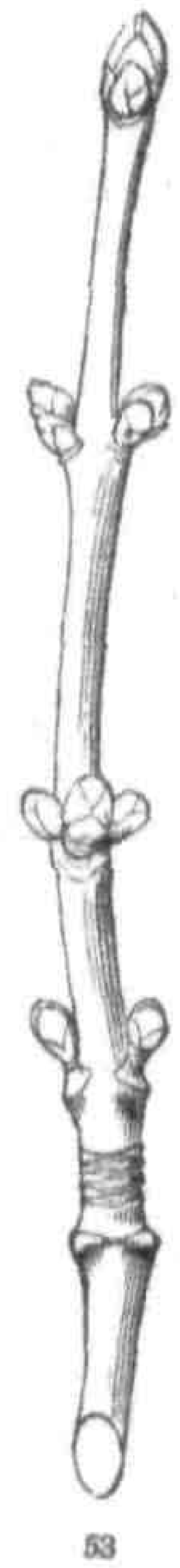
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60. **Sorts of Buds.** It may be useful to enumerate the kinds of buds which have now been mentioned, referring back to the paragraphs in which the peculiarities of each are explained. Buds, then, are either *terminal* or *lateral.* They are

Terminal when they rest on the apex of a stem (42). The earliest terminal bud is the *plumule* of the embryo (16).

Lateral, when they appear on the side of a stem: — of which the only regular kind is the

Axillary (43), namely, those which are situated in the axils of leaves.

Accessory or *Supernumerary* (59), when two or more occur in addition to the ordinary axillary bud.

Adventitious (58), when they occur out of the axils and without order, on stems or roots, or even on leaves. Any of these kinds may be, either

Naked, when without coverings; or *scaly*, when protected by scales (44, 45).

Latent, when they survive long without growing, and commonly without being visible externally (57).

Leaf-buds, when they contain leaves, and develop into a leafy shoot.

Flower-buds, when they contain blossoms, and no leaves, as the

FIG. 52. Butternut branch, with accessory buds, the uppermost above the axil.
FIG. 53. Red-Maple branch, with accessory buds placed side by side.

side-buds of the Red-Maple, or when they are undeveloped blossoms. These we shall have to consider hereafter.

Figure 54 represents a spreading-topped tree (American Elm), the stem dividing off into branches; and some spiry trees (Spruces on the right hand, and two of the Arbor-Vitæ on the left) with excurrent stems.

54

LESSON V.

MORPHOLOGY (i.e. VARIOUS SORTS AND FORMS) OF ROOTS.

61. **Morphology**, as the name (derived from two Greek words) denotes, is the doctrine of forms. In treating of forms in plants, the botanist is not confined to an enumeration or description of the shapes or sorts that occur, — which would be a dull and tedious business, — but he endeavors to bring to view *the relations between one form and another;* and this is an interesting study.

62. Botanists give particular names to all the parts of plants, and also particular terms to express their principal varieties in form. They use these terms with great precision and advantage in describing the species or kinds of plants. They must therefore be defined and explained in our books. But it would be a great waste of time

for the young student to learn them by rote. The student should rather consider the connection between one form and another; and notice how the one simple plan of the plant, as it has already been illustrated, is worked out in the greatest variety of ways, through the manifold diversity of forms which each of its three organs of vegetation — root, stem, and leaf — is made to assume.

63. This we are now ready to do. That is, having obtained a general idea of vegetation, by tracing the plant from the seed and the bud into the herb, shrub, or tree, we proceed to contemplate the principal forms under which these three organs occur in different plants, or in different parts of the same plant; or, in other words, to study the *morphology* of the root, stem, and leaves.

64. Of these three organs, the root is the simplest and the least varied in its modifications. Still it exhibits some widely different kinds. Going back to the beginning, we commence with

65. **The simple Primary Root,** which most plants send down from the root-end of the embryo as it grows from the seed; as we have seen in the Maple (Fig 5 – 7), Morning-Glory (Fig. 8 and 28), Beech (Fig. 14, 15), Oak and Buckeye (Fig. 22 – 24), &c. This, if it goes on to grow, makes a *main* or *tap* root, from which side-branches here and there proceed. Some plants keep this main root throughout their whole life, and send off only small side branches; as in the Carrot (Fig. 58) and Radish (Fig. 59): and in some trees, like the Oak, it takes the lead of the side-branches for many years, unless accidentally injured, as a strong tap-root. But commonly the main root divides off very soon, and is lost in the branches. We have already seen, also, that there may be at the beginning

66. **Multiple Primary Roots.** We have noticed them in the Pumpkin (Fig. 10), in the Pea (Fig. 20), and in Indian Corn (Fig. 42). That is, several roots have started all at once, or nearly so, from the seedling stem, and formed a bundle or cluster (a *fascicled* root, as it is called), in place of one main root. The Bean, as we observe in Fig. 18, begins with a main root, but some of its branches soon overtake it, and a cluster of roots is formed.

67. **Absorption of Moisture by Roots.** The branches of roots as they grow commonly branch again and again, into smaller roots or *rootlets;* in this way very much increasing the surface by which the plant connects itself with the earth, and absorbs moisture from it. The whole surface of the root absorbs, so long as it is fresh and new; and the newer the roots and rootlets are, the more freely do they

imbibe. Accordingly, as long as the plant grows above ground, and expands fresh foliage, from which moisture much of the time largely escapes into the air, so long it continues to extend and multiply its roots in the soil beneath, renewing and increasing the fresh surface for absorbing moisture, in proportion to the demand from above. And when growth ceases above ground, and the leaves die and fall, or no longer act, then the roots generally stop growing, and their soft and tender tips harden. From this period, therefore, until growth begins anew the next spring, is the best time for transplanting; especially for trees and shrubs, and herbs so large that they cannot well be removed without injuring the roots very much.

68. We see, on considering a moment, that an herb or a tree consists of two great surfaces, with a narrow part or trunk between them, — one surface spread out in the air, and the other in the soil. These two surfaces bear a certain proportion to each other; and the upper draws largely on the lower for moisture. Now, when the leaves fall from the tree in autumn, the vast surface exposed to the air is reduced to a very small part of what it was before; and the remainder, being covered with a firm bark, cannot lose much by evaporation. In common herbs the whole surface above ground perishes in autumn; and many of the rootlets die at the same time, or soon afterwards. So that the living vegetable is reduced for the time to the smallest compass, — to the thousandth or hundred-thousandth part of what it was shortly before, — and what remains alive rests in a dormant state, and may now be transplanted without much danger of harm. If any should doubt whether there is so great a difference between the summer and the winter size of plants, let them compare a lily-bulb with the full-grown Lily, or calculate the surface of foliage which

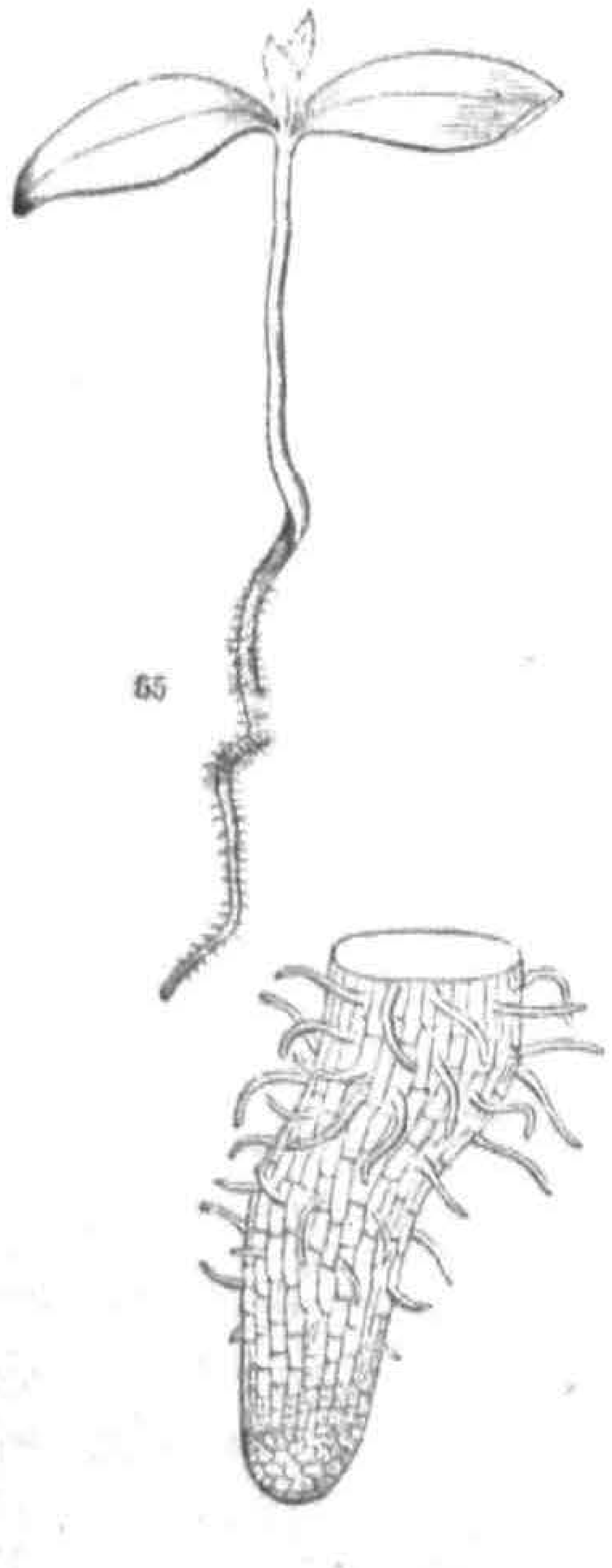

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FIG. 55. Seedling Maple, of the natural size, showing the root-hairs. 56. A bit of the end of the root magnified.

a tree exposes to the air, as compared with the surface of its twigs.

69. The absorbing surface of roots is very much greater than it appears to be, on account of the root-hairs, or slender fibrils, which abound on the fresh and new parts of roots. These may be seen with an ordinary magnifying-glass, or even by the naked eye in many cases; as in the root of a seedling Maple (Fig. 55), where the surface is thickly clothed with them. They are not rootlets of a smaller sort; but, when more magnified, are seen to be mere elongations of the surface of the root into slender tubes, which through their very delicate walls imbibe moisture from the soil with great avidity. They are commonly much longer than those shown in Fig. 56, which represents only the very tip of a root moderately magnified. Small as they are individually, yet the whole amount of absorbing surface added to the rootlets by the countless numbers of these tiny tubes is very great.

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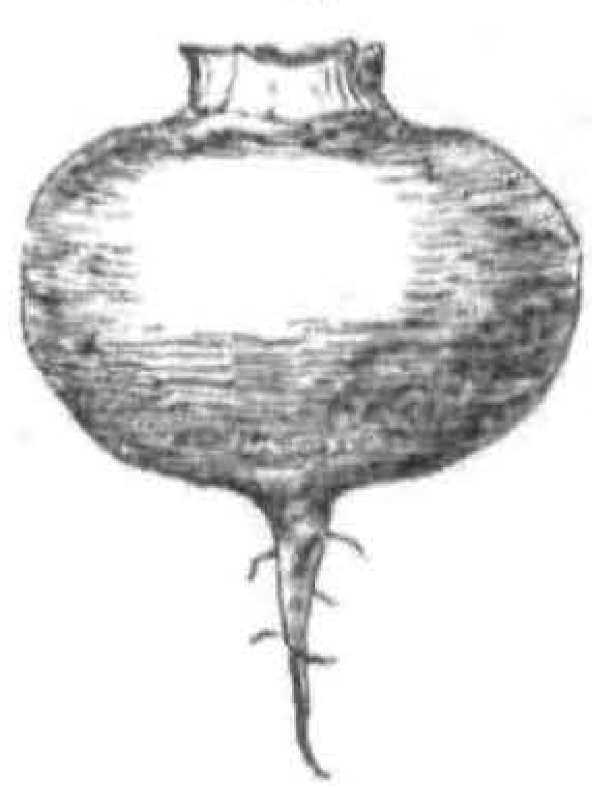

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70. Roots intended mainly for absorbing branch freely, and are slender or thread-like. When the root is principally of this character it is said to be *fibrous;* as in Indian Corn (Fig. 42), and other grain, and to some extent in all annual plants (41).

59

71. **The Root as a Storehouse of Food.** In biennial and many perennial herbs (41), the root answers an additional purpose. In the course of the season it becomes a storehouse of nourishment, and enlarges or thickens as it receives the accumulation. Such roots are said to be *fleshy;* and different names are applied to them according to

FIG. 57 58, 59. Forms of fleshy or thickened roots.

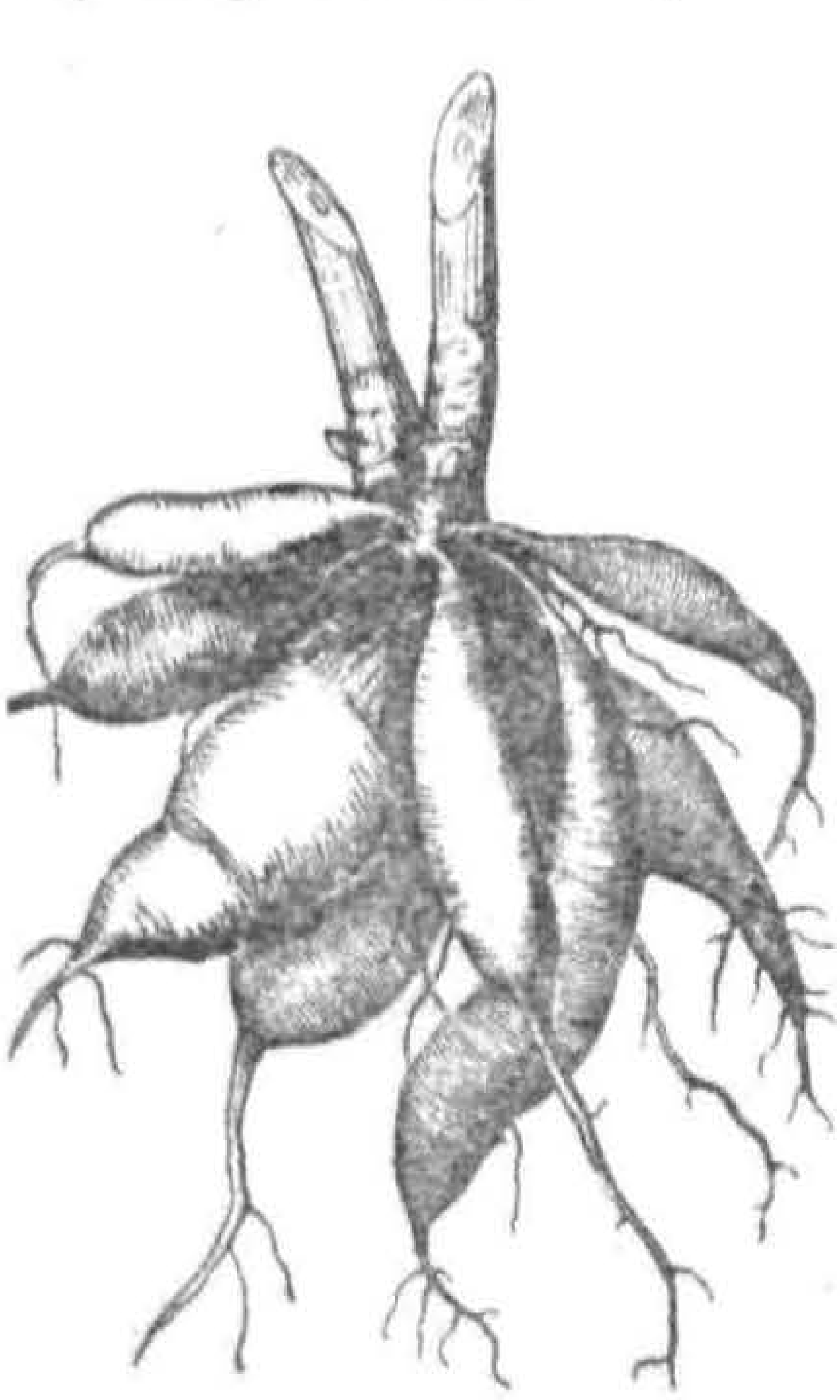
their shapes. We may divide them all into two kinds; 1st, those *consisting of one main root, and 2d, those without any main root.*

72. The first are merely different shapes of the *tap-root*; which is

Conical, when it thickens most at the crown, or where it joins the stem, and tapers regularly downwards to a point, as in the Common Beet, the Parsnip, and Carrot (Fig. 58):

Turnip-shaped or *napiform*, when greatly thickened above; but abruptly becoming slender below; as the Turnip (Fig. 57): and,

Spindle-shaped, or *fusiform*, when thickest in the middle and tapering to both ends; as the common Radish (Fig. 59).



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73. In the second kind, where there is no main root, the store of nourishing matter may be distributed throughout the branches or cluster of roots generally, or it may be accumulated in some of them, as we see in the *tuberous* roots of the Sweet Potato, the common Peony, and the Dahlia (Fig. 60).

74. All but the last of these illustrations are taken from *biennial* plants. These grow with a large tuft of leaves next the ground, and accumulate nourishment all the first summer, and store up all they produce beyond what is wanted at the time in their great root, which lives over the winter. We know very well what use man and other animals make of this store of food, in the form of starch, sugar, jelly, and the like. From the second year's growth we may learn what use the plant itself makes of it. The new shoots then feed upon it, and use it to form with great rapidity branches, flower-stalks, blossoms, fruit, and seeds; and, having used it up, the whole plant dies when the seeds have ripened.

75. In the same way the nourishment contained in the separate tuberous roots of the Sweet Potato and the Dahlia (Fig 60) is fed upon in the spring by the buds of the stem they belong to; and as they are emptied of their contents, they likewise die and decay. But meanwhile similar stores of nourishment, produced by the second year's vegetation, are deposited in new roots, which live through the

FIG. 60. Clustered tuberous roots of the Dahlia, with the bottom of the stem they belong to.

next winter, and sustain the third spring's growth, and so on; — these plants being *perennial* (41), or lasting year after year, though each particular root lives little more than one year.

76. Many things which commonly pass for roots are not really roots at all. Common potatoes are tuberous parts of stems, while sweet potatoes are roots, like those of the Dahlia (Fig. 60). The difference between them will more plainly appear in the next Lesson.

77. **Secondary Roots.** So far we have considered only the original or primary root, — that which proceeded from the lower end of the first joint of stem in the plantlet springing from the seed, — and its subdivisions. We may now remark, that any other part of the stem will produce roots just as well, whenever favorably situated for it; that is, when covered by the soil, which provides the darkness and the moisture which is congenial to them. For these *secondary* roots, as they may be called, partake of the ordinary disposition of the organ: they avoid the light, and seek to bury themselves in the ground. In Indian Corn we see roots early striking from the second and the succeeding joints of stem under ground, more abundantly than from the first joint (Fig. 42). And all stems that keep up a connection with the soil — such as those which creep along on or beneath its surface — are sure to strike root from almost every joint. So will most branches when bent to the ground, and covered with the soil: and even cuttings from the branches of most plants can be made to do so, if properly managed. Propagation by buds depends upon this. That is, a piece of a plant which has stem and leaves, either developed or in the bud, may be made to produce roots, and so become an independent plant.

78. In many plants the disposition to strike root is so strong, that they even will spring from the stem above ground. In Indian Corn, for example, it is well known that roots grow, not only from all those joints round which the earth is heaped in hoeing, but also from those several inches above the soil: and other plants produce them from stems or branches high in the air. Such roots are called

79. **Aerial Roots.** All the most striking examples of these are met with, as we might expect, in warmer and damper climates than ours, and especially in deep forests which shut out much of the light; this being unfavorable to roots. The Mangrove of tropical shores, which occurs on our own southern borders; the Sugar Cane, from which roots strike just as in Indian Corn, only from higher up the stem; the Pandanus, called Screw Pine (not from its resemblance to a

Pine-tree, but because it is like a Pine-apple plant); and the famous Banyan of India, and some other Fig-trees, furnish the most remarkable examples of roots, which strike from the stem or the branches in the open air, and at length reach the ground, and bury themselves, when they act in the same manner as ordinary roots.

80. Some of our own common plants, however, produce small *aerial rootlets;* not for absorbing nourishment, but for climbing. By these rootlets, that shoot out abundantly from the side of the stems and branches, the Trumpet Creeper, the Ivy of Europe, and our Poison Rhus, — here called Poison Ivy, — fasten themselves firmly to walls, or the trunks of trees, often ascending to a great height. Here roots serve the same purpose that tendrils do in the Grape-Vine and Virginia Creeper. Another form, and the most aerial of all roots, since they never reach the ground, are those of

81. **Epiphytes, or Air-Plants.** These are called by the first name (which means growing on plants), because they are generally found upon the trunks and branches of trees; — not that they draw any nourishment from them, for their roots merely adhere to the bark, and they flourish just as well upon dead wood or any other convenient support. They are called *air-plants* because they really live altogether upon what they get from the air, as they have no connection with the soil. Hundreds of air-plants grow all around us without attracting any attention, because they are small or humble. Such are the Lichens and Mosses that abound on the trunks or boughs of trees, especially on the shaded side, and on old walls, fences, or rocks, from which they obtain no nourishment. But this name is commonly applied only to the larger, flower-bearing plants which live in this way. These belong to warm and damp parts of the world, where there is always plenty of moisture in the air. The greater part belong to the Orchis family and to the Pine-Apple family; and among them are some of the handsomest flowers known. We have two or three flowering air-plants in the Southern States, though they are not showy ones. One of them is an Epidendrum growing on the boughs of the Great-flowered Magnolia: another is the Long-Moss, or Black Moss, so called, — although it is no Moss at all, — which hangs from the branches of Oaks and Pines in all the warm parts of the Southern States. (Fig 61 represents both of these. The upper is the Epidendrum conopseum; the lower, the Black Moss, Tillandsia usneoides.)

82. **Parasitic Plants** exhibit roots under yet another remarkable

aspect. For these are not merely fixed upon other plants, as air-plants are, but strike their roots, or what answer to roots, into them, and feed on their juices. Not only Moulds and Blights (which are plants of very low organization) live in this predacious way, but many flowering herbs, and even shrubs. One of the latter is the Mistletoe, the seed of which germinates on the bough of the tree where it falls or is left by birds; and the forming root penetrates the bark and engrafts itself into the wood, to which it becomes united as firmly as a natural branch to its parent stem; and indeed the parasite lives just as if it were a branch of the tree it grows and feeds on. A most common parasitic herb is the Dodder; which abounds in low grounds everywhere in summer, and coils its long and slender leafless, yellowish stems — resembling tangled threads of yarn — round and round the stalks of other plants; wherever they touch piercing the bark with minute and very short rootlets in the form of suckers, which draw out the nourishing juices of the plants laid hold of. Other parasitic plants, like the Beech-drops and Pine-sap, fasten their roots under ground upon the roots of neighboring plants, and rob them of their rich juices.

LESSON VI.

MORPHOLOGY OF STEMS AND BRANCHES.

83. The growth of the stem in length, and the formation of branches, have been considered already. Their growth in thickness we may study to more advantage in a later Lesson. The very various forms which they assume will now occupy our attention,— beginning with

84. **The Forms of Stems and Branches above ground.** The principal differences as regards size and duration have been mentioned before (41); namely, the obvious distinction of plants into herbs, shrubs, and trees, which depends upon the duration and size of the stem. The stem is accordingly

Herbaceous, when it dies down to the ground every year, or after blossoming.

Suffrutescent, when the bottom of the stem above the soil is a little woody, and inclined to live from year to year.

Suffruticose, when low stems are decidedly woody below, but herbaceous above.

Fruticose, or *shrubby*, when woody, living from year to year, and of considerable size,— not, however, more than three or four times the height of a man.

Arborescent, when tree-like in appearance, or approaching a tree in size.

Arboreous, when forming a proper tree trunk.

85. When the stem or branches rise above ground and are apparent to view, the plant is said to be *caulescent* (that is, to have a *caulis* or true stem). When there is no evident stem above ground, but only leaves or leaf-stalks and flower-stalks, the plant is said to be *acaulescent*, i. e. *stemless*, as in the Crocus, Bloodroot, common Violets, &c., and in the Beet, Carrot, and Radish (Fig. 59), for the first season. There is a stem, however, in all such cases, only it remains on or beneath the ground, and is sometimes very short. Of course leaves and flowers do not arise from the root. These concealed sorts of stem we will presently study.

86. The direction taken by stems, &c., or their mode of growth,

gives rise to several terms, which may be briefly mentioned: — such as

Diffuse, when loosely spreading in all directions.

Declined, when turned or bending over to one side.

Decumbent, reclining on the ground, as if too weak to stand.

Assurgent or *ascending*, when rising obliquely upwards.

Procumbent or *prostrate*, lying flat on the ground from the first.

Creeping, or *repent*, when prostrate stems on or just beneath the ground strike root as they grow; as does the White Clover, the little Partridge-berry, &c.

Climbing, or *scandent*, when stems rise by clinging to other objects for support, — whether by *tendrils*, as do the Pea, Grape-Vine, and Virginia Creeper (Fig. 62); by their twisting leaf-stalks, as the Virgin's Bower; or by rootlets, like the Ivy, Poison Ivy, and Trumpet Creeper (80).

Twining, or *voluble*, when stems rise by coiling themselves spirally around other stems or supports; like the Morning-Glory and the Bean.

87. Certain forms of stems have received distinct names. The jointed stem of Grasses and Sedges is called by botanists a *culm;* and the peculiar scaly trunk of Palms and the like (Fig 47) is sometimes called a *caudex*. A few forms of branches the gardener distinguishes by particular names; and they are interesting from their serving for the natural propagation of plants from buds, and for suggesting ways by which we artificially multiply plants that would not propagate themselves without the gardener's aid. These are *suckers*, *offsets*, *stolons*, and *runners*.

88. **Suckers** are ascending branches rising from stems under ground, such as are produced so abundantly by the Rose, Raspberry, and other plants said to multiply "by the root." If we uncover them, we see at once the great difference between these subterranean branches and real roots. They are only creeping branches under ground. Remarking how the upright shoots from these branches become separate plants, simply by the dying off of the connecting under-ground stems, the gardener expedites the result by cutting them through with his spade. That is, he propagates the plant "by division."

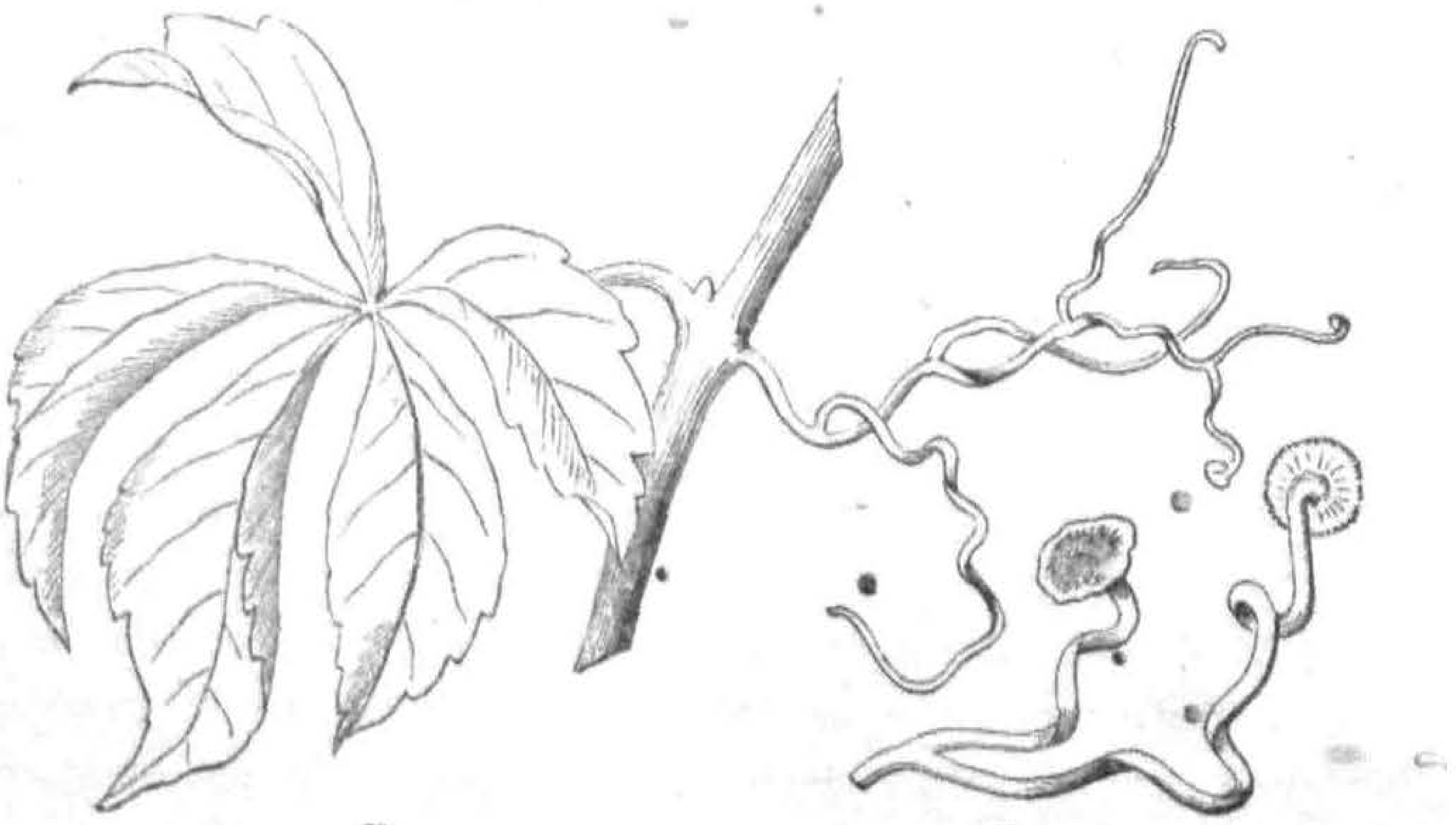
89. **Stolons** are trailing or reclining branches above ground, which strike root where they touch the soil, and then send up a vigorous shoot, which has roots of its own, and becomes an independent plant when the connecting part dies, as it does after a while. The Currant

and the Gooseberry naturally multiply in this way, as well as by suckers (which we see are just the same thing, only the connecting part is concealed under ground). They must have suggested the operation of *layering*, or bending down and covering with earth branches which do not naturally make stolons; and after they have taken root, as they almost always will, the gardener cuts through the connecting stem, and so converts a rooting branch into a separate plant.

90. **Offsets**, like those of the Houseleek, are only short stolons, with a crown of leaves at the end.

91. **Runners**, of which the Strawberry presents the most familiar example, are a long and slender, tendril-like, leafless form of creeping branches. Each runner, after having grown to its full length, strikes root from the tip, and fixes it to the ground, then forms a bud there, which develops into a tuft of leaves, and so gives rise to a new plant, which sends out new runners to act in the same way. In this manner a single Strawberry plant will spread over a large space, or produce a great number of plants, in the course of the summer; — all connected at first by the slender runners; but these die in the following winter, if not before, and leave the plants as so many separate individuals.

92. **Tendrils** are branches of a very slender sort, like runners, not destined like them for propagation, and therefore always destitute



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of buds or leaves, but intended for climbing. Those of the Grape-Vine, of the Virginia Creeper (Fig. 62), and of the Cucumber and

FIG. 62. Piece of the stem of Virginia Creeper, bearing a leaf and a tendril. 63. Tips of a tendril, about the natural size, showing the disks by which they hold fast to walls, &c.

Squash tribe are familiar illustrations. The tendril commonly grows straight and outstretched until it reaches some neighboring support, such as a stem, when its apex hooks around it to secure a hold; then the whole tendril shortens itself by coiling up spirally, and so draws the shoot of the growing plant nearer to the supporting object. When the Virginia Creeper climbs the side of a building or the smooth bark of a tree, which the tendrils cannot lay hold of in the usual way, their tips expand into a flat disk or sucker (Fig. 62, 63), which adheres very firmly to the wall or bark, enabling the plant to climb over and cover such a surface, as readily as the Ivy does by means of its sucker-like little rootlets. The same result is effected by different organs, in the one case by branches in the form of tendrils; in the other, by roots.

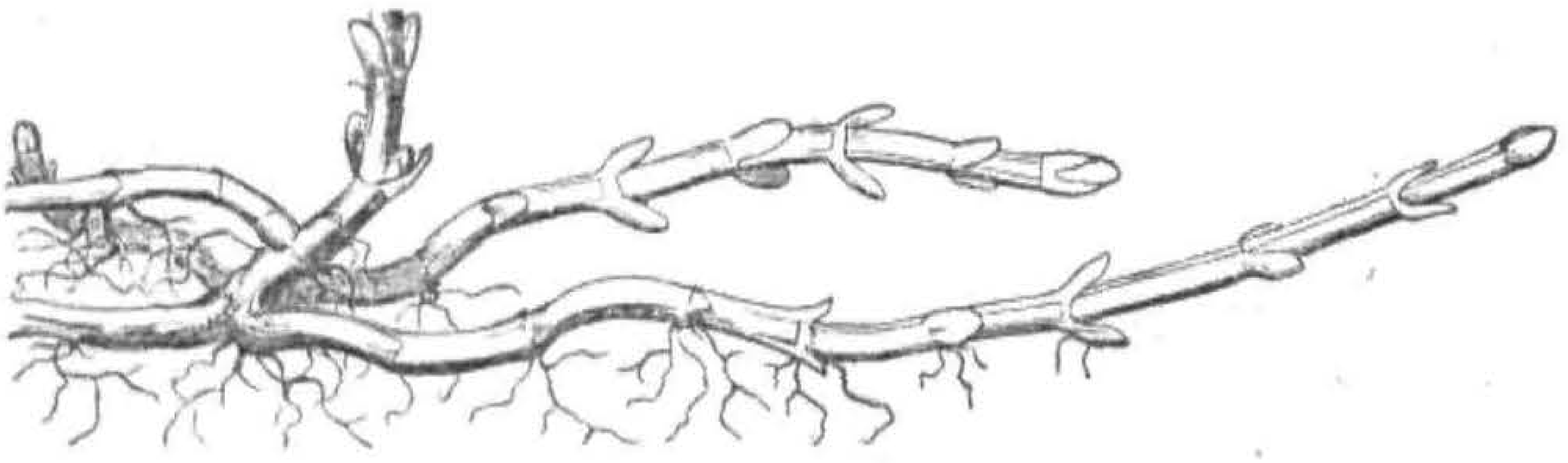
93. Tendrils, however, are not always branches; some are leaves, or parts of leaves, as those of the Pea (Fig. 20). Their nature in each case is to be learned from their position, whether it be that of a leaf or of a branch. In the same way

94. **Spines or Thorns** sometimes represent leaves, as in the Barberry, where their nature is shown by their situation *outside* of an axillary bud or branch. In other words, here they have a bud in their axil, and are therefore leaves; so we shall have to mention them in another place. Most commonly spines are stunted and hardened branches, arising from the axils of leaves, as in the Hawthorn and Pear. A neglected Pear-tree or Plum-tree shows every gradation between ordinary branches and thorns. Thorns sometimes branch, their branches partaking of the same spiny character: in this way those on the trunks of Honey-Locust trees (produced from adventitious buds, 58) become exceedingly complicated and horrid. The thorns on young shoots of the Honey-Locust may appear somewhat puzzling at first view; for they are situated some distance above the axil of the leaf. Here the thorn comes from the uppermost of several supernumerary buds (59). *Prickles*, such as those of the Rose and Blackberry, must not be confounded with thorns: these have not the nature of branches, and have no connection with the wood; but are only growths of the bark. When we strip off the bark, the prickles go with it.

95. Still stranger forms of stems and branches than any of these are met with in some tribes of plants, such as Cactuses (Fig. 76). These will be more readily understood after we have considered some of the commoner forms of

96. **Subterranean Stems and Branches.** These are very numerous and various; but they are commonly overlooked, or else confounded with roots. From their situation they are out of the sight of the superficial observer: but if sought for and examined, they will well repay the student's attention. For the vegetation that is carried on under ground is hardly less varied, and no less interesting and important, than that which meets our view above ground. All their forms may be referred to four principal kinds; namely, the *Rhizoma* or *Rootstock*, the *Tuber*, the *Corm*, and the *Bulb*.

97. **The Rootstock, or Rhizoma,** in its simplest form, is merely a creeping stem or branch (86) growing beneath the surface of the soil, or partly covered by it. Of this kind are the so-called *creeping, running*, or *scaly roots*, such as those by which the Mint (Fig. 64), the Scotch Rose, the Couch-grass or Quick-grass, and many other plants, spread so rapidly and widely, "by-the root," as it is said.



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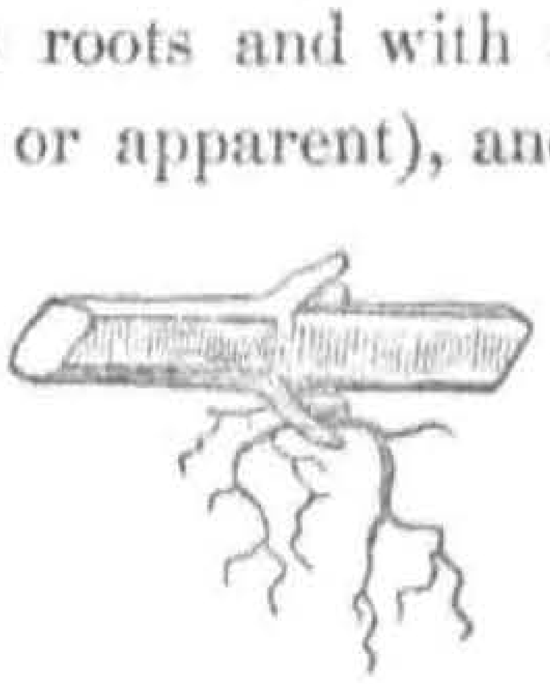
That these are really *stems*, and not roots, is evident from the way in which they grow; from their consisting of a succession of joints; and from the leaves which they bear on each joint (or *node*, as the botanist calls the place from which leaves arise), in the form of small scales, just like the lowest ones on the upright stem next the ground. Like other stems, they also produce buds in the axils of these scales, showing the scales to be leaves; whereas real roots bear neither leaves nor axillary buds. Placed, as they are, in the damp and dark soil, such stems naturally produce roots, just as the creeping stem does where it lies on the surface of the ground; but the whole appearance of these roots, their downward growth, and their mode of branching, are very different from that of the subterranean stem they spring from.

98. It is easy to see why plants with these running rootstocks take such rapid and wide possession of the soil,—often becoming great pests to farmers,—and why they are so hard to get rid of. They are

FIG. 64. Rootstocks, or creeping subterranean branches, of the Peppermint.

always perennials (41); the subterranean shoots live over the first winter, if not longer, and are provided with vigorous buds at every joint. Some of these buds grow in spring into upright stems, bearing foliage, to elaborate the plant's crude food into nourishment, and at length produce blossoms for reproduction by seed; while many others, fed by nourishment supplied from above, form a new generation of subterranean shoots; and this is repeated over and over in the course of the season or in succeeding years. Meanwhile as the subterranean shoots increase in number, the older ones, connecting the series of generations into one body, die off year by year, liberating the already rooted side-branches as so many separate plants; and so on indefinitely. Cutting these running rootstocks into pieces, therefore, by the hoe or the plough, far from destroying the plant, only accelerates the propagation; it converts one many-branched plant into a great number of separate individuals. Even if you divide the shoots into as many pieces as there are joints of stem, each piece (Fig. 65) is already a plantlet, with its roots and with a bud in the axil of its scale-like leaf (either latent or apparent), and having prepared nourishment enough in the bit of stem to develop this bud into a leafy stem; and so a single plant is all the more speedily converted into a multitude. Such plants as the Quick-grass accordingly realize the fable of the Hydra; as fast as one of its many branches is cut off, twice as many, or more, spring up in its stead. Whereas, when the subterranean parts are only roots, cutting away the stem completely destroys the plant, except in the rather rare cases where the root produces adventitious buds (58).



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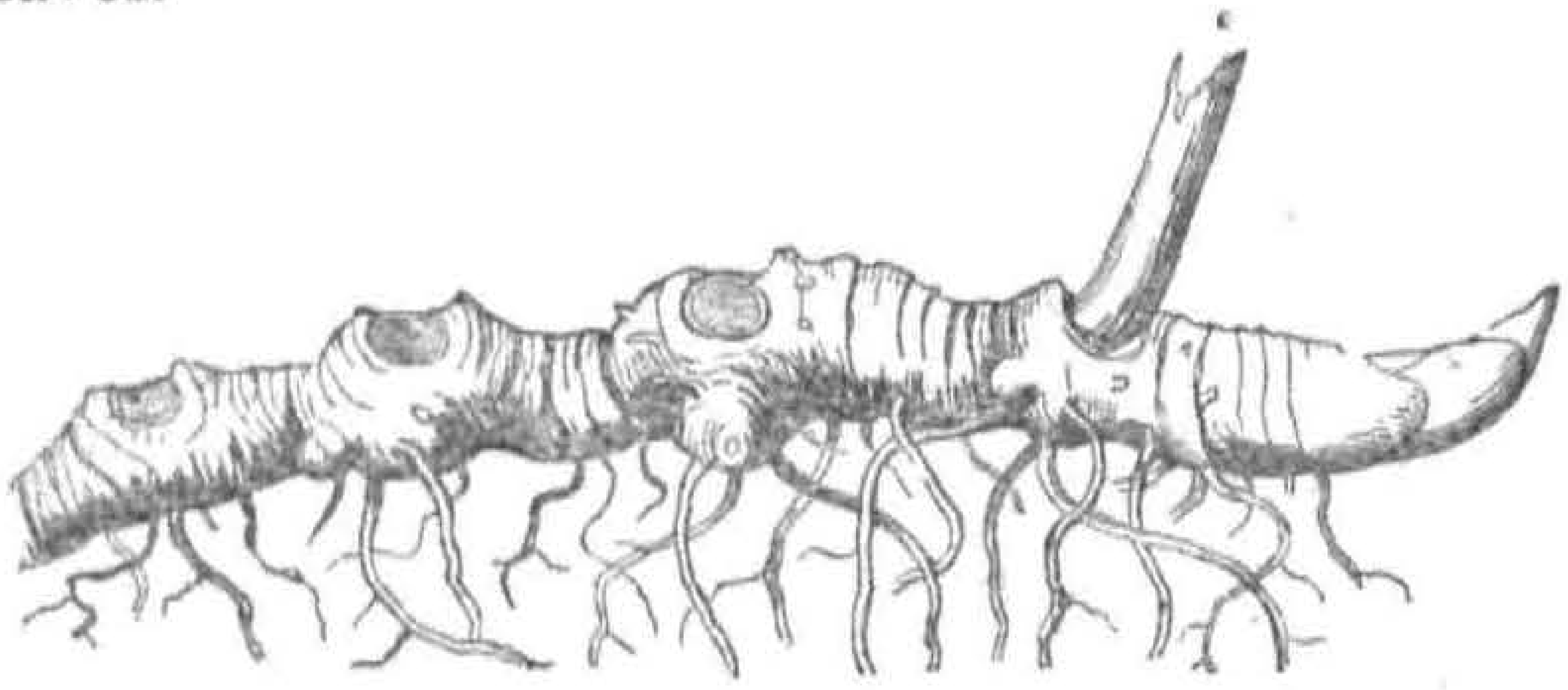
99. The more nourishment rootstocks contain, the more readily do separate portions, furnished with buds, become independent plants. It is to such underground stems, thickened with a large amount of starch, or some similar nourishing matter stored up in their tissue, that the name of *rhizoma* or rootstock is commonly applied; — such, for example, as those of the Sweet Flag or Calamus, of Ginger, of Iris or Flower-de-luce (Fig. 133), and of the Solomon's Seal (Fig. 66).

100. The rootstocks of the common sorts of Iris of the gardens usually lie on the surface of the ground, partly uncovered; and they bear real leaves (Fig. 133), which closely overlap each other;

FIG. 65. A piece of the running rootstock of the Peppermint, with its node or joint, and an axillary bud ready to grow.

the joints (i. e. the *internodes*, or spaces between each leaf) being very short. As the leaves die, year by year, and decay, a scar left in the form of a ring marks the place where each leaf was attached. Instead of leaves, rootstocks buried under ground commonly bear scales, like those of the Mint (Fig. 64), which are imperfect leaves.



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101. Some rootstocks are marked with large round scars of a different sort, like those of the Solomon's Seal (Fig. 66), which gave this name to the plant, from their looking something like the impression of a seal upon wax. Here the rootstock sends up every spring an herbaceous stalk or stem, which bears the foliage and flowers, and dies in autumn; and the *seal* is the circular scar left by the death and separation of the dead stalk from the living rootstock. As but one of these is formed each year, they mark the limits of a year's growth. The bud at the end of the rootstock in the figure, which was taken in summer, will grow the next spring into the stalk of the season, which, dying in autumn, will leave a similar scar, while another bud will be formed farther on, crowning the ever-advancing summit or growing end of the stem.

102. As each year's growth of stem, in all these cases, makes its own roots, it soon becomes independent of the older parts. And after a certain age, a portion dies off behind, every year, about as fast as it increases at the growing end; — death following life with equal and certain step, with only a narrow interval between. In vigorous plants of Solomon's Seal or Iris, the living rootstock is several inches or a foot in length; while in the short rootstock of

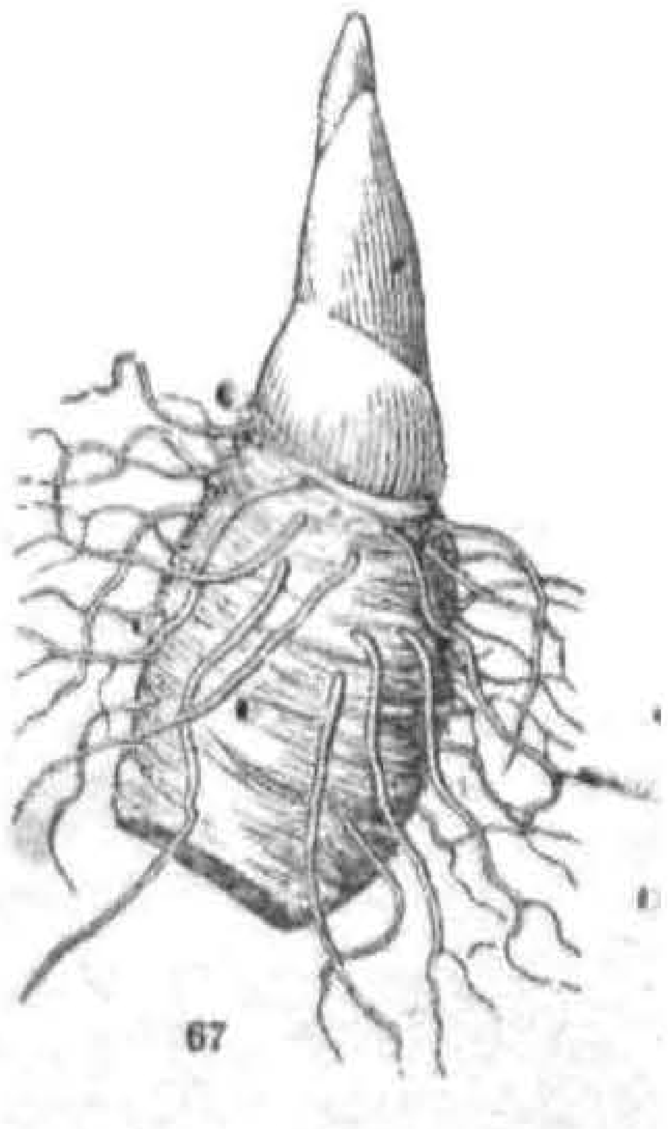

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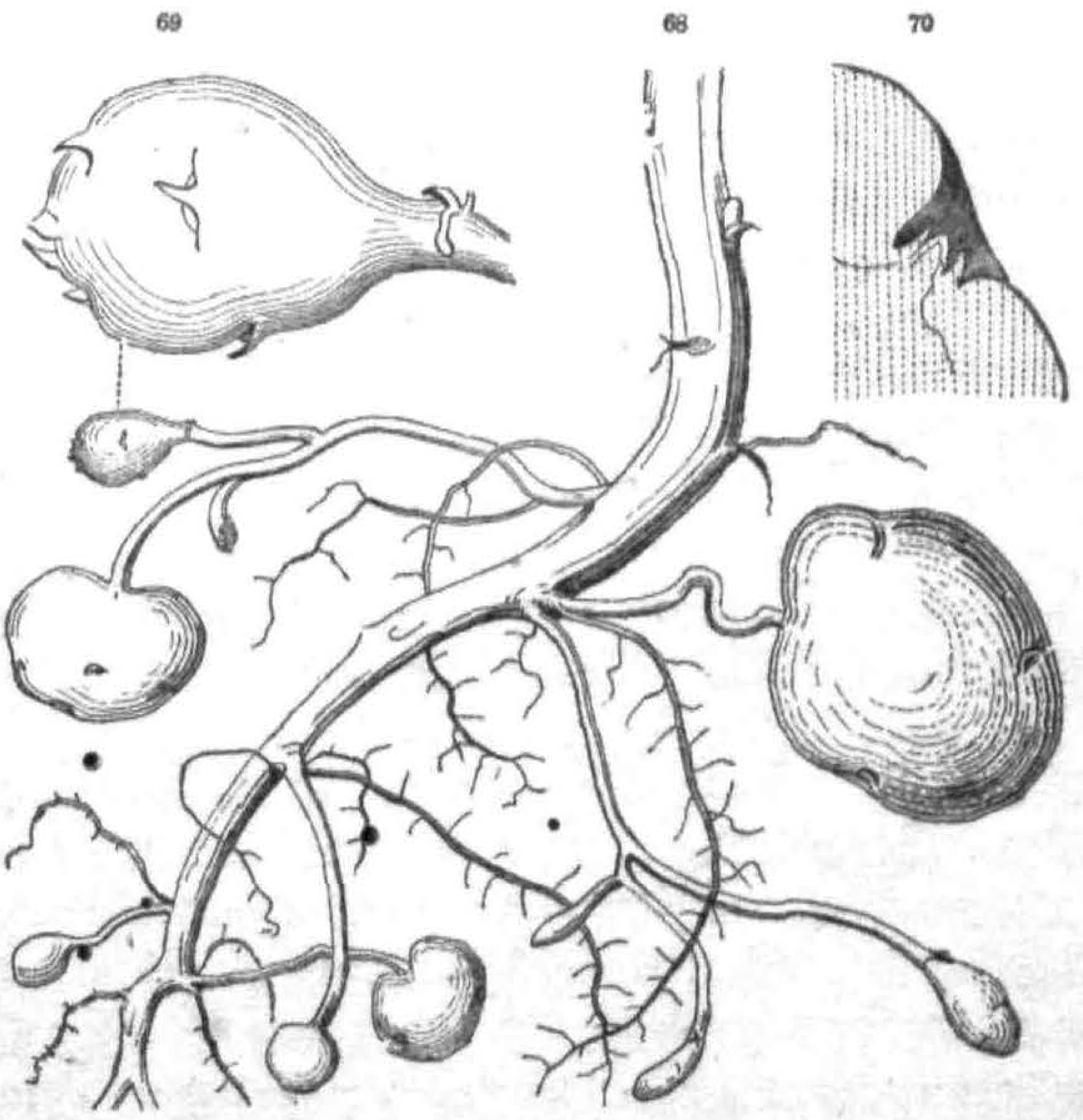
FIG. 66. Rootstock of Solomon's Seal, with the bottom of the stalk of the season, and the bud for the next year's growth.

FIG. 67. The very short rootstock and bud of a Trillium or Birthroot.

Trillium or Birthroot (Fig. 67) life is reduced to a very narrow span, only an inch or less intervening between death beneath and young life in the strong bud annually renewed at the summit.

103. **A Tuber** is a thickened portion of a rootstock. When slender subterranean branches, like those of the Quick-grass or Mint (Fig. 64), become enlarged at the growing end by the accumulation there of an abundance of solid nourishing matter, *tubers* are produced, like those of the Nut-grass of the Southern States (which accordingly becomes a greater pest even than the Quick-grass), and of the Jerusalem Artichoke, and the Potato. The whole formation may be seen at a glance in Figure 68, which represents the subterranean growth of a Potato-plant, and shows the tubers in all their stages, from shoots just beginning to enlarge at the tip, up to fully-formed potatoes. And Fig. 69, — one of the forming tubers moderately magnified, — plainly shows the leaves of this thickening shoot, in the form of little scales. It is under these scales that the *eyes* appear (Fig. 70): and these are evidently axillary buds (43).



104. Let us glance for a moment at the economy or mode of life of the Potato-plant, and similar vegetables, as shown in the *mor-*

FIG. 68. Forming tubers of the Potato. 69. One of the very young potatoes, moderately magnified. 70. Slice of a portion through an eye, more magnified.

phology of the branches, — that is, in the different forms they appear under, and the purposes they serve. The Potato-plant has three principal forms of branches: — 1. Those that bear ordinary leaves, expanded in the air, to digest what they gather from it and what the roots gather from the soil, and convert it into nourishment. 2. After a while a second set of branches at the summit of the plant bear flowers, which form fruit and seed out of a portion of the nourishment which the leaves have prepared. 3. But a larger part of this nourishment, while in a liquid state, is carried down the stem, into a third sort of branches under ground, and accumulated in the form of starch at their extremities, which become tubers, or depositories of prepared solid food; — just as in the Turnip, Carro, Dahlia, &c. (Fig. 57 – 60), it is deposited in the root. The use of the store of food is obvious enough. In the autumn the whole plant dies, except the seeds (if it formed them) and the tubers; and the latter are left disconnected in the ground. Just as that small portion of nourishing matter which is deposited in the seed (3, and Fig. 34) feeds the embryo when it germinates, so the much larger portion deposited in the tuber nourishes its buds, or eyes, when they likewise grow, the next spring, into new plants. And the great supply enables them to shoot with a greater vigor at the beginning, and to produce a greater amount of vegetation than the seedling plant could do in the same space of time; which vegetation in turn may prepare and store up, in the course of a few weeks or months, the largest quantity of solid nourishing material, in a form most available for food. Taking advantage of this, man has transported the Potato from the cool Andes of South America to other cool climates, and makes it yield him a copious supply of food, especially in countries where the season is too short, or the summer's heat too little, for profitably cultivating the principal grain-plants.

105. All the sorts of subterranean stems or branches distinguished by botanists pass into one another by gradations. We have seen how nearly related the tuber is to the rootstock, and there are many cases in which it is difficult to say which is the proper name to use. So likewise,

106. **The Corm, or Solid Bulb**, like that of the Indian Turnip and the Crocus (Fig. 71), is just a very short and thick rootstock; as will be seen by comparing Fig. 71 with Fig. 67. Indeed, it grows so very little in length, that it is often much broader than long, as in the Indian Turnip, and the Cyclamen of our greenhouses. Corms

are usually upright, producing buds on their upper surface and roots from the lower. But (as we see in the Crocus here figured) buds may shoot from just above any of the faint cross lines or rings, which are the scars left by the death and decay of the sheathing bases of former leaves. That is, these are axillary buds. In these extraordinary (just as in ordinary) stems, the buds are either axillary or terminal. The whole mode of growth is just the same, only the corm does not increase in length faster than it does in thickness. After a few years some of the buds grow into new corms at the expense of the old one; the young ones taking the nourishment from the parent, and storing up a large part of it in their own tissue. When exhausted in this way, as well as by flowering, the old corm dies, and its shrivelled and decaying remains may be found at the side of or beneath the present generation, as we see in the Crocus (Fig. 71).

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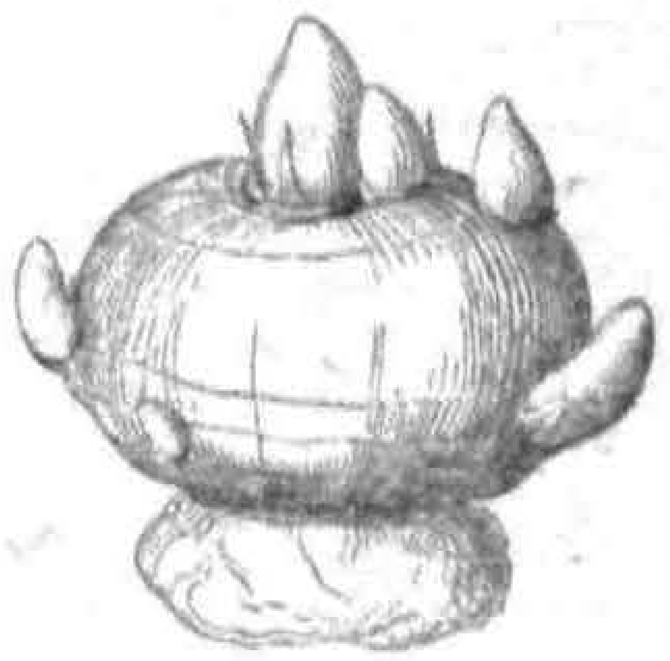

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107. The corm of a Crocus is commonly covered with a thin and dry, scaly or fibrous husk, consisting of the dead remains of the bases of former leaves. When this husk consists of many scales, there is scarcely any distinction left between the corm and

108. **The Bulb.** This is an extremely short subterranean stem, usually much broader than high, producing roots from underneath, and covered with leaves or the bases of leaves, in the form of thickened scales. It is, therefore, the same as a corm, or solid bulb, only it bears an abundance of leaves or scales, which make up the greater part of its bulk. Or we may regard it as a bud, with thick and fleshy scales. Compare a Lily-bulb (Fig. 73) with the strong scaly buds of the Hickory and Horsechestnut (Fig. 48 and 49), and the resemblance will be apparent enough.

109. Bulbs serve the same purpose as tubers, rootstocks, or corms. The main difference is, that in these the store of food for future growth is deposited in the stem; while in the bulb, the greater part is deposited in the bases of the leaves, changing them into thick scales, which closely overlap or enclose one another, because the stem does not elongate enough to separate them. That the scales

FIG. 71. Corm or solid bulb of a Crocus. 72. The same, cut through lengthwise.

of the bulb are the bases of leaves may be seen at once by following any of the ground-leaves (root-leaves as they are incorrectly called) down to their origin in the bulb. Fig. 75 represents one of them from the White Lily; the thickened base, which makes a scale, being cut off below, to show its thickness. After having lasted its time and served its purpose as foliage, the green leaf dies, down to the thickened base, which remains as a scale of the bulb. And year after year, as the bulb grows from the centre, to produce the vegetation and the flowers of the season, the outer scales yield up their store of nourishment for the purpose, and perish.

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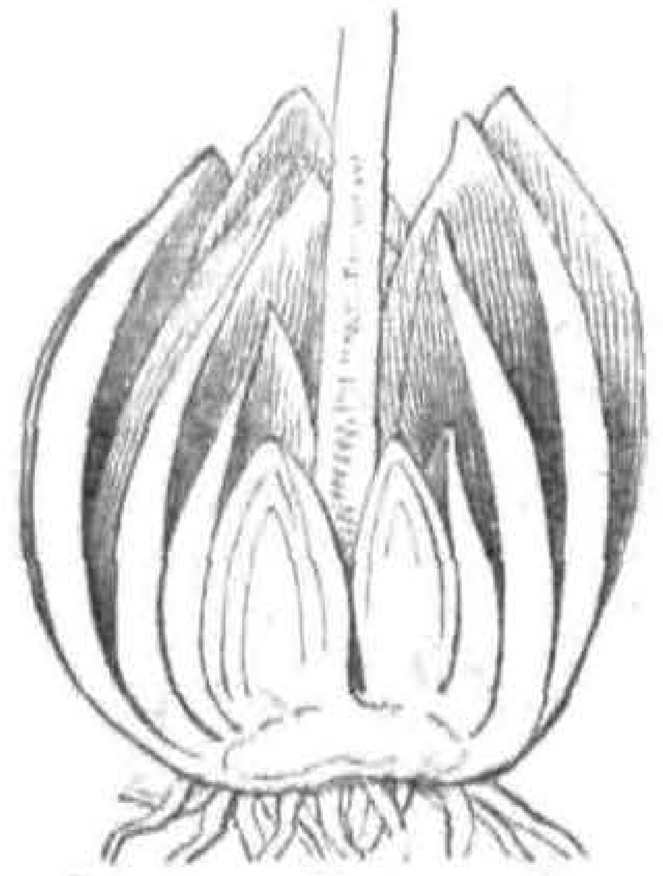

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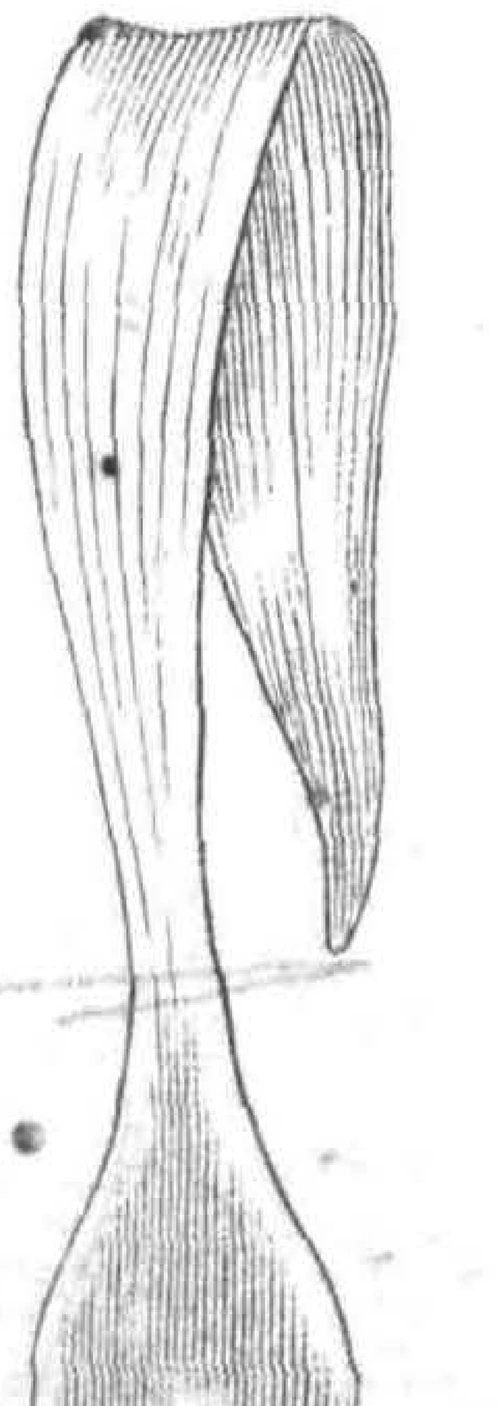
110. Each scale, being a leaf, may have a bud in its axil. Some of these buds grow into leafy and flowering stems above ground: others grow into new bulbs, feeding on the parent, and at length destroying it, in the same way that corms do, as just described (106).

111. When the scales are broad and enwrap all that is within so as to form a succession of coats, one over another, the bulb is said to be *tunicated* or *coated.* The Tulip, Hyacinth, Leek, and Onion afford such familiar examples of coated bulbs that no figure is needed. When the scales are narrow and separate, as in the Lily (Fig. 73), the bulb is said to be *scaly.*



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112. **Bulblets** are small bulbs formed above ground on some plants; as in the axils of the leaves of the common bulbiferous Lily of the gardens, and often in the flower-clusters of the Leek and Onion. They are plainly nothing but bulbs with thickened scales. They never grow into branches, but detach themselves when full grown, and fall to the ground, to take root there and form new plants.

113. From the few illustrations already given, attentive students

FIG. 73. Bulb of the Meadow or Canada Lily. 74. The same, cut through lengthwise.
FIG. 75. A lower leaf of White Lily, with its base under ground thickened into a bulb-scale.

can hardly fail to obtain a good idea of what is meant by *morphology* in Botany; and they will be able to apply its simple principles for themselves to all forms of vegetation. They will find it very interesting to identify all these various subterranean forms with the common plan of vegetation above ground. There is the same structure, and the same mode of growth in reality, however different in appearance, and however changed the form, to suit particular conditions, or to accomplish particular ends. It is plain to see, already, that the plant is constructed *according to a plan*, — a very simple one, — which is exhibited by all vegetables, by the extraordinary no less than by the ordinary kinds; and that the same organ may appear under a great many different shapes, and fulfil very different offices.

114. These extraordinary shapes are not confined to subterranean vegetation. They are all repeated in various sorts of *fleshy plants;* in the Houseleek, Aloe, Agave (Fig. 82), and in the many and strange shapes which the Cactus family exhibit (Fig. 76); shapes which imitate rootstocks, tubers, corms, &c. above ground. All these we may regard as

115. **Consolidated Forms of Vegetation.** While ordinary plants are constructed on the plan of great spread of surface (131), these are formed on the plan of the least possible amount of surface in proportion to their bulk. The Cereus genus of Cactuses, for example, consisting of solid columnar trunks (Fig. 76, *b*), may be likened to rootstocks. A green rind serves the purpose of foliage; but the surface is as nothing compared with an ordinary leafy plant of the same bulk. Compare, for instance, the largest Cactus known, the Giant Cereus of the Gila River (Fig. 76, in the background), which rises to the height of fifty or sixty feet, with a common leafy tree of the same height, such as that in Fig. 54, and estimate how vastly greater, even without the foliage, the surface of the latter is than that of the former. Compare, in the same view, an Opuntia or Prickly-Pear Cactus, its stem and branches formed of a succession of thick and flattened joints (Fig. 76, *a*), which may be likened to tubers, or an Epiphyllum (*d*), with shorter and flatter joints, with an ordinary leafy shrub or herb of equal size. And finally, in Melon-Cactuses or Echinocactus (*c*), with their globular or bulb-like shapes, we have plants in the compactest shape; their spherical figure being such as to expose the least possible amount of its bulk to the air.

116. These *consolidated plants* are evidently adapted and designed

for very *dry regions;* and in such only are they found. Similarly, bulbous and corm-bearing plants, and the like, are examples of a form of vegetation which in the growing season may expand a large surface to the air and light, while during the period of rest the living vegetable is reduced to a globe, or solid form of the least possible surface; and this is protected by its outer coats of dead and dry scales, as well as by its situation under ground. Such plants exhibit another and very similar adaptation to a season of drought. And they mainly belong to countries (such as Southern Africa, and parts of the interior of Oregon and California) which have a long hot season during which little or no rain falls, when, their stalks and foliage above and their roots beneath being early cut off by drought, the plants rest securely in their compact bulbs, filled with nourishment, and retaining their moisture with great tenacity, until the rainy season comes round. Then they shoot forth leaves and flowers with wonderful rapidity, and what was perhaps a desert of arid sand becomes green with foliage and gay with blossoms, almost in a day. This will be more perfectly understood when the nature and use of foliage have been more fully considered. (Fig. 76 represents several forms of Cactus vegetation.)

LESSON VII.

MORPHOLOGY OF LEAVES.

117. In describing the subterranean forms of the stem, we have been led to notice already some of the remarkable forms under which leaves occur; namely, as *scales*, sometimes small and thin, as those of the rootstocks of the Quick-grass, or the Mint (Fig. 64), sometimes large and thick, as those of bulbs (Fig. 73 – 75), where they are commonly larger than the stem they belong to. We have seen, too, in the second Lesson, the seed-leaves (or cotyledons) in forms as unlike foliage as possible; and in the third Lesson we have spoken of bud-scales as a sort of leaves. So that the botanist recognizes the leaf under other forms than that of foliage.

118. We may call foliage the *natural form* of leaves, and look upon the other sorts as *special forms*, — as *transformed* leaves: by this term meaning only that what would have been ordinary leaves under other circumstances (as, for instance, those on shoots of Mint, Fig. 64, had these grown upright in the air, instead of creeping under ground) are developed in special forms to serve some particular purpose. For the Great Author of Nature, having designed plants upon one simple plan, just adapts this plan to all cases. So, whenever any special purpose is to be accomplished, no new instruments or organs are created for it, but one of the three general organs of the vegetable, *root*, *stem*, or *leaf*, is made to serve the purpose, and is adapted to it by taking some peculiar form.

119. It is the study of the varied forms under this view that constitutes *Morphology* (61), and gives to this part of Botany such great interest. We have already seen stems and roots under a great variety of forms. But leaves appear under more various and widely different forms, and answer a greater variety of purposes, than do both the other organs of the plant put together. We have to consider, then, *leaves as foliage*, and *leaves as something else than foliage*. As we have just been noticing cases of leaves that are not foliage, we may consider these first, and enumerate the principal kinds.

120. **Leaves as Depositories of Food.** Of these we have had plenty of instances in the seed-leaves, such as those of the Almond, Apple-

seed (Fig. 11), Beech (Fig. 13 – 15), the Bean and Pea (Fig. 16 – 20), the Oak (Fig. 21, 22), and Horsechestnut (Fig. 23, 24); where the food upon which the plantlet feeds when it springs from the seed is stored up in its cotyledons or first leaves. And we have noticed how very unlike foliage such leaves are. Yet in some cases, as in the Pumpkin (Fig. 10), they actually grow into green leaves as they get rid of their burden.

77

121. **Bulb-Scales** (Fig. 73 – 75) offer another instance, which we were considering at the close of the last Lesson. Here a part of the nourishment prepared in the foliage of one year is stored up in the scales, or subterranean thickened leaves, for the early growth and flowering of the next year; and this enables the flowers to appear before the leaves, or as soon as they do; as in Hyacinths, Snowdrops, and many bulbous plants.

122. **Leaves as Bud-scales, &c.** True to its nature, the stem produces leaves even under ground, where they cannot serve as foliage, and where often, as on rootstocks and tubers (97 – 103), they are not of any use that we know of. In such cases they usually appear as thin scales. So the first leaves of the stems of herbs, as they sprout from the ground, are generally mere scales, such as those of an Asparagus shoot; and such are the first leaves on the stem of the seedling Oak (Fig. 22) and the Pea (Fig. 20). Similar scales, however, often serve an important purpose; as when they form the covering of buds, where they protect the tender parts within (44). That bud-scales are

FIG. 77. Leaves of a developing bud of the Low Sweet Buckeye (Æsculus parviflora), showing a nearly complete set of gradations from a scale to a compound leaf of five leaflets.

leaves is plainly shown, in many cases, by the gradual transition between them and the first foliage of the shoot. The Common Lilac and the Shell-bark Hickory are good instances of the sort. But the best illustration is furnished by the Low Sweet Buckeye of the Southern States, which is often cultivated as an ornamental shrub.* From one and the same growing bud we may often find all the gradations which are shown in Fig. 77.

78

123. **Leaves as Spines** occur in several plants. The most familiar instance is that of the Common Barberry. In almost any summer shoot, most of the gradations may be seen between the ordinary leaves, with sharp bristly teeth, and leaves which are reduced to a branching spine or thorn, as shown in Fig. 78. The fact that the spines of the Barberry produce a leaf-bud in their axil also proves them to be leaves.

124. **Leaves as Tendrils** are to be seen in the Pea and the Vetch (Fig. 20, 127), where the upper part of each leaf becomes a tendril, which the plant uses to climb by; and in one kind of Vetch the whole leaf is such a tendril.

79

125. **Leaves as Pitchers**, or hollow tubes, are familiar to us in the common Pitcher-plant or Side-saddle Flower (Sarracenia, Fig. 79) of our bogs. These pitchers are generally half-full of water, in which flies and other insects are drowned, often in such numbers as to make a rich manure for the plant, no doubt; though we can hardly imagine this to be the design of the pitcher. Nor do we perceive here any need of a contrivance to hold water, since the roots of these plants are always well supplied by the wet bogs where they grow.

FIG. 78. Summer shoot of Barberry, showing the transition of leaves into spines.
FIG. 79. Leaf of Sarracenia purpurea, entire, and another with the upper part cut off.

LESSON VIII.

MORPHOLOGY OF LEAVES AS FOLIAGE.

130. HAVING in the last Lesson glanced at some of the special or extraordinary forms and uses of leaves, we now return to leaves in their ordinary condition, namely, as foliage. We regard this as the natural state of leaves. For although they may be turned to account in other and very various ways, as we have just seen, still their proper office in vegetation is to serve as foliage. In this view we may regard

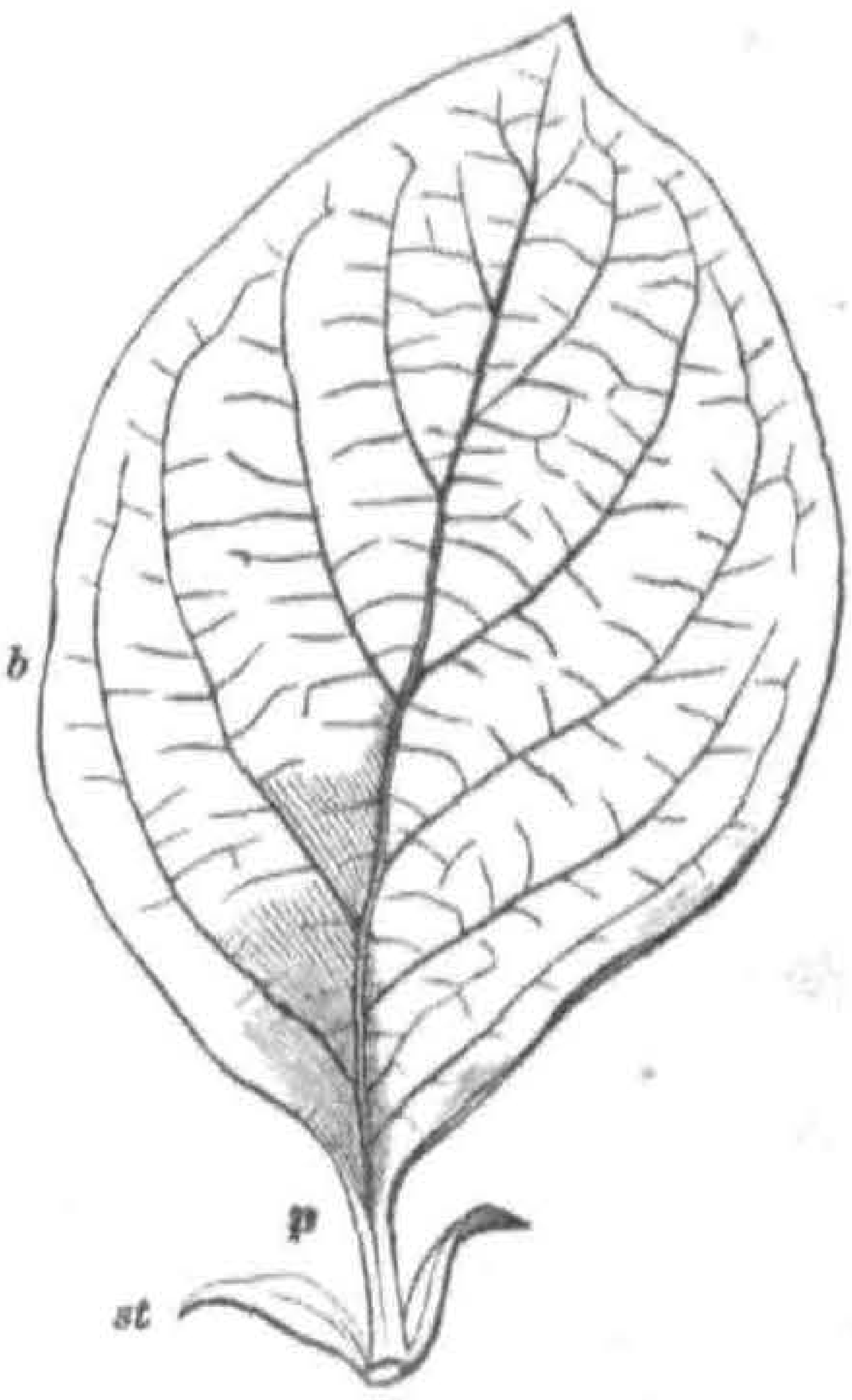
131. **Leaves as a Contrivance for Increasing the Surface** of that large part of the plant which is exposed to the light and the air. This is shown by their expanded form, and ordinarily slight thickness in comparison with their length and breath. While a Melon-Cactus (115, Fig. 76) is a striking example of a plant with the least possible amount of surface for its bulk, a repeatedly branching leafy herb or tree presents the largest possible extent of surface to the air. The actual amount of surface presented by a tree in full leaf is much larger than one would be apt to suppose. Thus, the Washington Elm at Cambridge — a tree of no extraordinary size — was some years ago estimated to produce a crop of seven millions of leaves, exposing a surface of 200,000 square feet, or about five acres, of foliage.

132. What is done by the foliage we shall have to explain in another place. Under the present head we are to consider ordinary leaves as to their *parts* and their *shapes*.

133. **The Parts of the Leaf.** The principal part of a leaf is the blade, or expanded portion, one face of which naturally looks toward the sky, the other towards the earth. The blade is often raised on a stalk of its own, and on each side of the stalk at its base there is sometimes an appendage called a *stipule*. A complete leaf, therefore consists of a *blade* (Fig. 83, *b*), a *foot-stalk* or *leaf-stalk*, called the *petiole* (*p*), and a pair of *stipules* (*st*). See also Fig. 136.

134. It is the blade which we are now to describe. This, as being the essential and conspicuous part, we generally regard as the leaf: and it is only when we have to particularize, that we speak of the *blade*, or *lamina*, of the leaf.

135. Without here entering upon the subject of the anatomy of the leaf, we may remark, that leaves consist of two sorts of material, viz.: 1. the *green pulp*, or *parenchyma;* and 2. the *fibrous framework*, or skeleton, which extends throughout the soft green pulp and supports it, giving the leaf a strength and firmness which it would not otherwise possess. Besides, the whole surface is covered with a transparent skin, called the *epidermis*, like that which covers the surface of the shoots, &c.



136. The framework consists of *wood*, — a fibrous and tough material which runs from the stem through the leaf-stalk, when there is one, in the form of parallel threads or bundles of fibres; and in the blade these spread out in a horizontal direction, to form the *ribs* and *veins* of the leaf. The stout main branches of the framework (like those in Fig. 50) are called the *ribs*. When there is only one, as in Fig. 83, &c., or a middle one decidedly larger than the rest, it is called the *midrib*. The smaller divisions are termed *veins;* and their still smaller subdivisions, *veinlets*.

137. The latter subdivide again and again, until they become so fine that they are invisible to the naked eye. The fibres of which they are composed are hollow; forming tubes by which the sap is brought into the leaves and carried to every part. The arrangement of the framework in the blade is termed the

138. **Venation**, or mode of veining. This corresponds so completely with the general shape of the leaf, and with the kind of division when the blade is divided or lobed, that the readiest way to study and arrange the forms of leaves is first to consider their veining.

139. Various as it appears in different leaves, the veining is all reducible to two principal kinds; namely, the *parallel-veined* and the *netted-veined*.

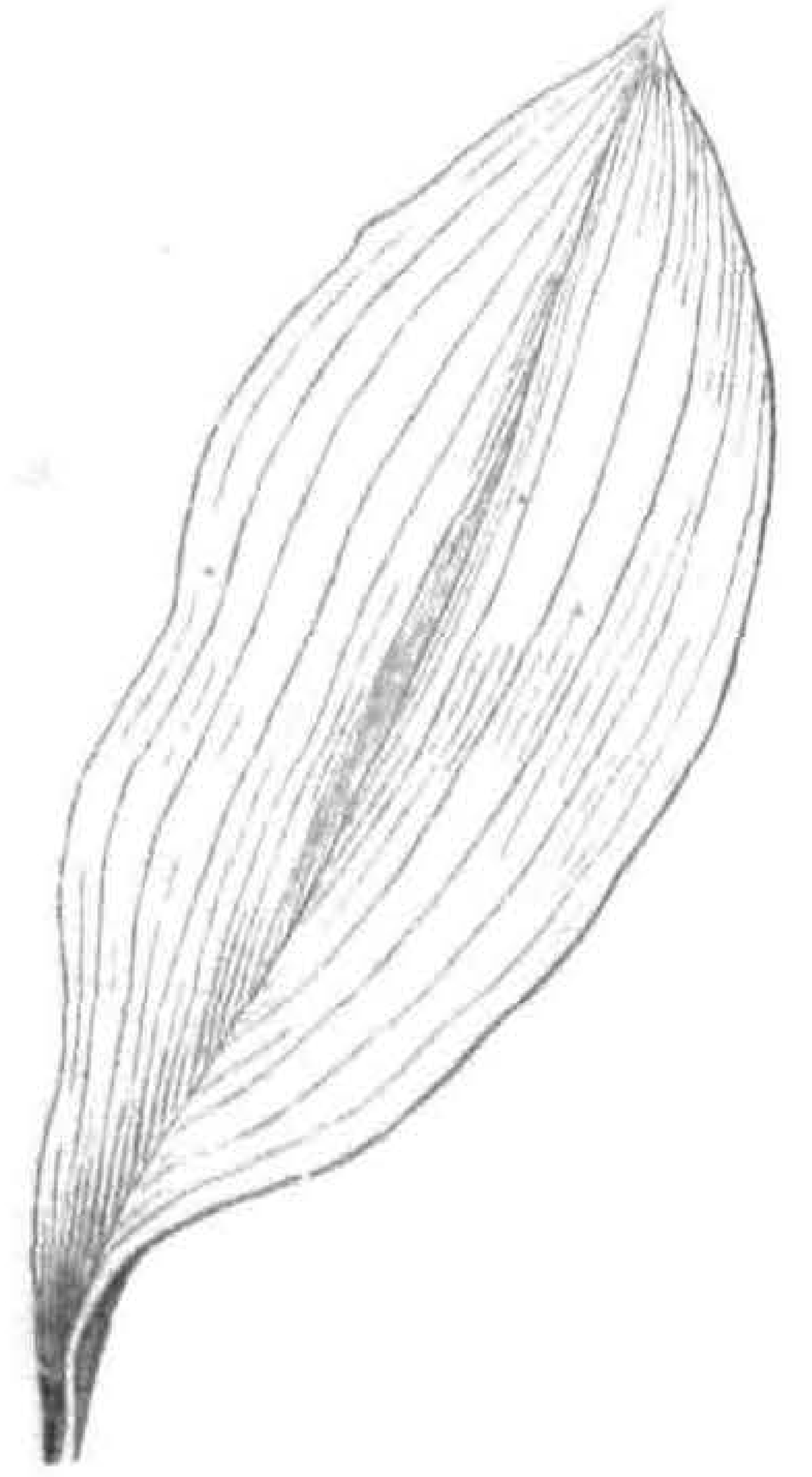
140. In *netted-veined* (also called *reticulated*) leaves, the veins branch off from the main rib or ribs, divide into finer and finer

FIG 83 Leaf of the Quince: *b*, blade; *p*, petiole; *st*, stipules.

veinlets, and the branches unite with each other to form meshes of network. That is, they *anastomose*, as anatomists say of the veins and arteries of the body. The Quince-leaf, in Fig. 83, shows this kind of veining in a leaf with a single rib. The Maple, Basswood, and Buttonwood (Fig. 50) show it in leaves of several ribs.

141. In *parallel-veined* leaves, the whole framework consists of slender ribs or veins, which run parallel with each other, or nearly so, *from the base to the point of the leaf, not dividing and subdividing*, nor forming meshes, except by very minute cross-veinlets. The leaf of any grass, or that of the Lily of the Valley (Fig. 84) will furnish a good illustration.

142. Such simple, parallel veins Linnæus, to distinguish them, called *nerves*, and parallel-veined leaves are still commonly called *nerved* leaves, while those of the other kind are said to be *veined*; — terms which it is convenient to use, although these "nerves" and "veins" are *all the* same thing, and have no likeness to the *nerves* of animals.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143. *Netted-veined* leaves belong to plants which have a pair of seed-leaves or cotyledons, such as the Maple (Fig. 1–7), Beech (Fig. 15), Pea and Bean (Fig. 18, 20), and most of the illustrations in the first and second Lessons. While *parallel-veined* or *nerved* leaves belong to plants with one cotyledon or true seed-leaf; such as the Iris (Fig. 134) and Indian Corn (Fig. 42). So that a mere glance at the leaves of the tree or herb enables one to tell what the structure of the embryo is, and to refer the plant to one or the other of these two grand classes, — which is a great convenience. For generally when plants differ from each other in some one important respect, they differ correspondingly in other respects as well.

144. Parallel-veined leaves are of two sorts; one kind, and the commonest, having the ribs or nerves all running from the base to the point of the leaf, as in the examples already given; while in another kind they run from a midrib to the margin; as in the com-

FIG. 84. A (parallel-veined) leaf of the Lily of the Valley.

mon Pickerel-weed of our ponds, in the Banana (Fig. 47), and many similar plants of warm climates.

145. Netted-veined leaves are also of two sorts, as is shown in the examples already referred to. In one case the veins all rise from a single rib (the midrib), as in Fig. 83. Such leaves are called *feather-veined* or *pinnately-veined;* both terms meaning the same thing, namely, that the veins are arranged on the sides of the rib like the plume of a feather on each side of the shaft.

146. In the other case (as in the Buttonwood, Fig. 50, Maple, &c.), the veins branch off from three, five, seven, or nine ribs, which spread from the top of the leaf-stalk, and run through the blade like the toes of a web-footed bird. Hence these are said to be *palmately* or *digitately* veined, or (since the ribs diverge like rays from a centre) *radiate-veined.*

147. Since the general outline of leaves accords with the framework or skeleton, it is plain that *feather-veined* leaves will incline to elongated shapes, or at least will be longer than broad; while in *radiate-veined* leaves more rounded forms are to be expected. A glance at the following figures shows this. Whether we consider the veins of the leaf to be adapted to the shape of the blade, or the green pulp to be moulded to the framework, is not very material. Either way, the outline of each leaf corresponds with the mode of spreading, the extent, and the relative length of the veins. Thus, in oblong or elliptical leaves of the feather-veined sort (Fig. 87, 88), the principal veins are nearly equal in length; while in ovate and heart-shaped leaves (Fig. 89, 90), those below the middle are longest; and in leaves which widen upwards (Fig. 91 – 94), the veins above the middle are longer than the others.

148. Let us pass on, without particular reference to the kind of veining, to enumerate the principal

149. **Forms of Leaves as to General Outline.** It is necessary to give names to the principal shapes, and to define them rather precisely, since they afford the easiest marks for distinguishing species. The same terms are used for all other flattened parts as well, such as the petals of the flowers; so that they make up a great part of the descriptive language of Botany. We do not mention the names of common plants which exhibit these various shapes. It will be a good exercise for young students to look them up and apply them.

150. Beginning with the narrower and proceeding to the broadest forms, a leaf is said to be

Linear (Fig. 85), when narrow, several times longer than wide, and of the same breadth throughout.

Lanceolate, or *lance-shaped*, when several times longer than wide, and tapering upwards (Fig. 86), or both upwards and downwards.

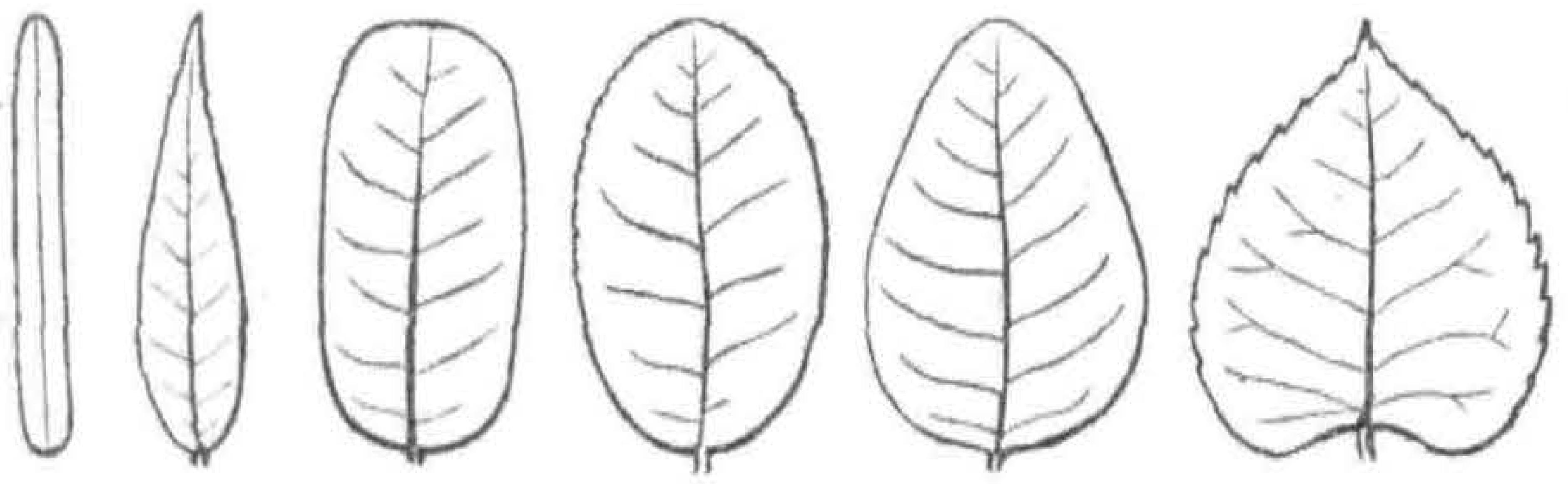
Oblong (Fig. 87), when nearly twice or thrice as long as broad.

Elliptical (Fig. 88) is oblong with a flowing outline, the two ends alike in width.

Oval is the same as broadly elliptical, or elliptical with the breadth considerably more than half the length.

Ovate (Fig. 89), when the outline is like a section of a hen's-egg lengthwise, the broader end downward.

Orbicular, or *rotund* (Fig. 102), circular in outline, or nearly so.



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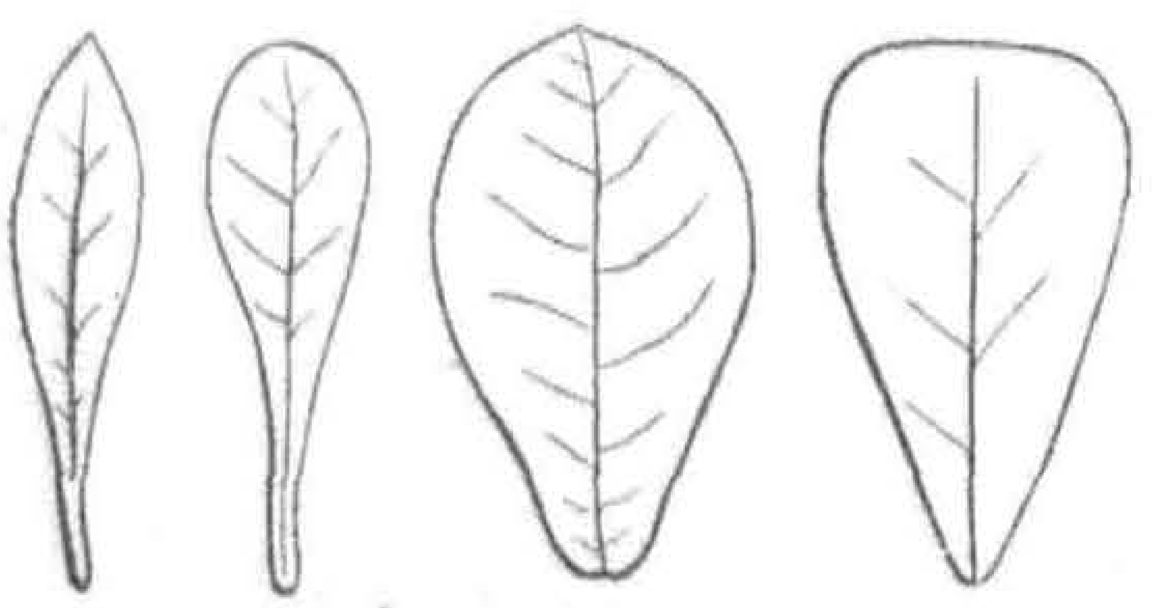
151. When the leaf tapers towards the base, instead of upwards, it may be

Oblanceolate (Fig. 91), which is lance-shaped, with the more tapering end downwards;



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Spatulate (Fig. 92), rounded above and long and narrow below, like a spatula;

Obovate (Fig. 93), or inversely ovate, that is, ovate with the narrower end down; or

Cuneate, or *cuneiform*, that is, *wedge-shaped* (Fig. 94), broad above and tapering by straight lines to an acute angle at the base.

152. **As to the Base**, its shape characterizes several forms, such as

Cordate, or *heart-shaped* (Fig. 90, 99, 8), when a leaf of an ovate form, or something like it, has the outline of its rounded base turned in (forming a notch or *sinus*) where the stalk is attached.

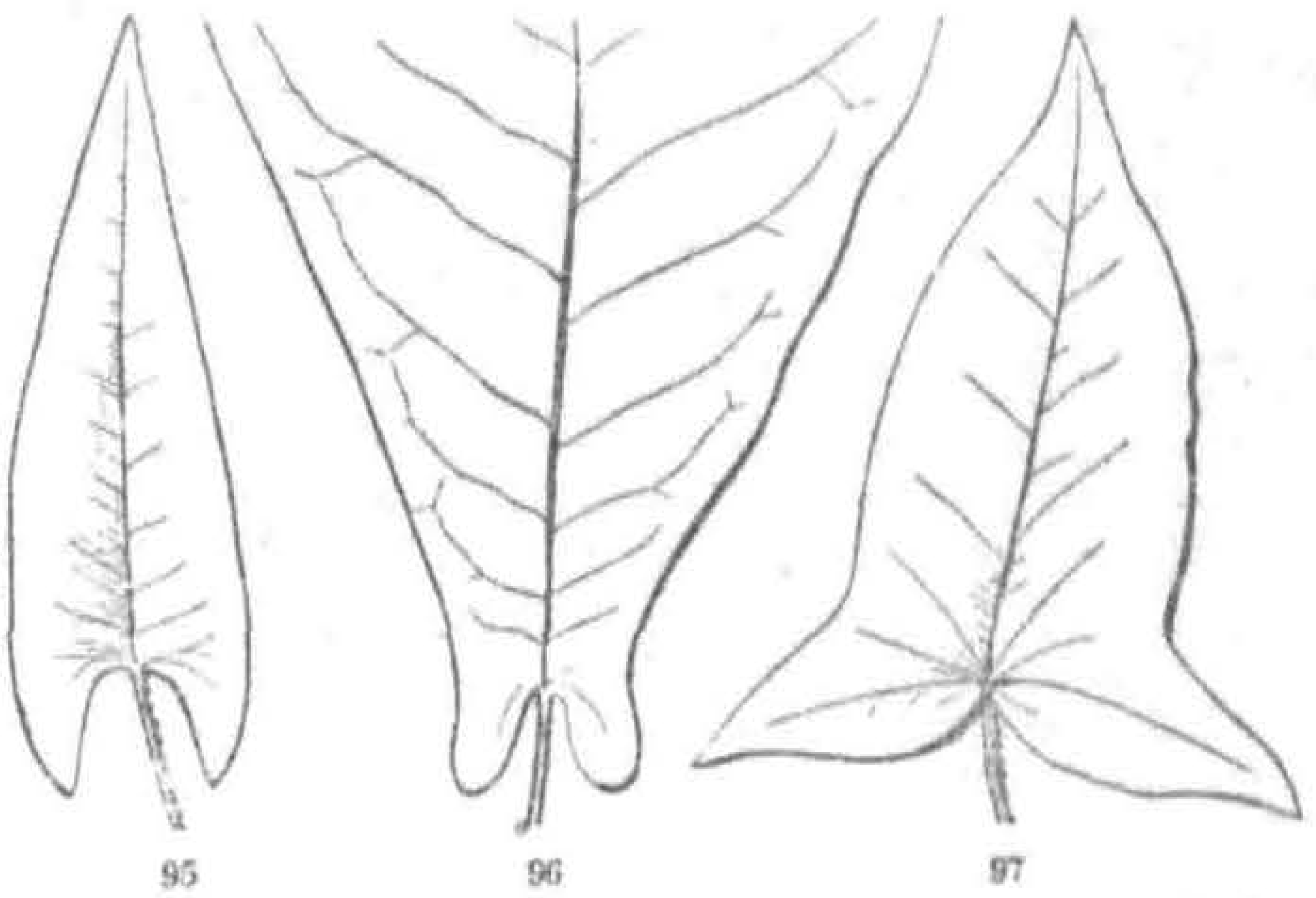
Reniform, or *kidney-shaped* (Fig. 100), like the last, only rounder and broader than long.

FIG. 85-90. Various forms of feather-veined leaves.

FIG. 91. Oblanceolate, 92. spatulate, 93. obovate, 94. wedge-shaped, feather-veined leaves.

Auriculate, or *eared*, having a pair of small and blunt projections, or *ears*, at the base, as in one species of Magnolia (Fig. 96).

Sagittate, or *arrow-shaped*, where such ears are pointed and turned downwards, while the main body of the blade tapers upwards to a point, as in the common Sagittaria or Arrow-head, and in the Arrow-leaved Polygonum (Fig. 95).



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Hastate, or *halberd-shaped*, when such lobes at the base point outwards, giving the leaf the shape of the halberd of the olden time, as in another Polygonum (Fig. 97).

Peltate, or *shield-shaped*, (Fig. 102,) is the name applied to a curious modification of the leaf, commonly of a rounded form, where the footstalk is attached to the lower surface, instead of the base, and

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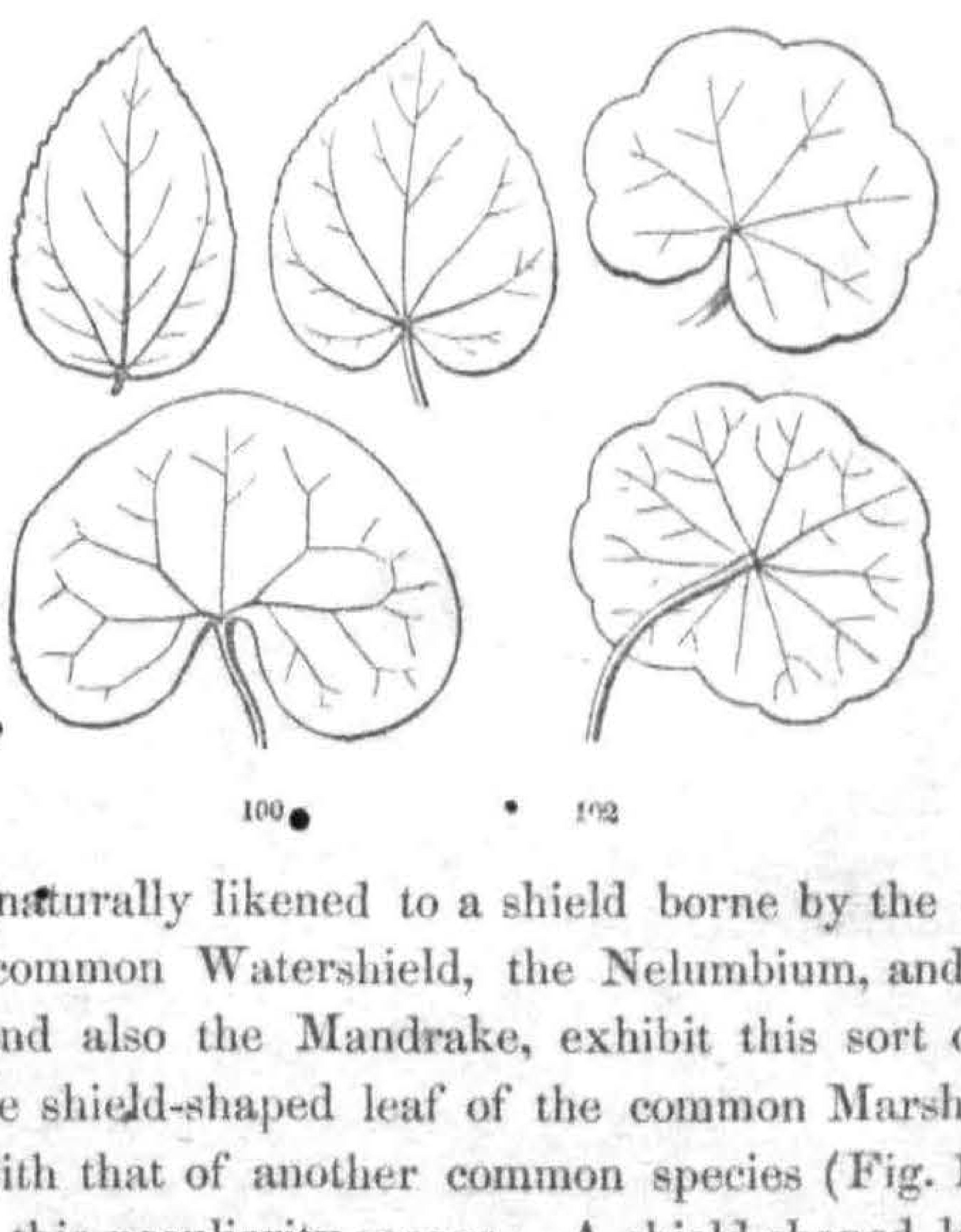


100 102

therefore is naturally likened to a shield borne by the outstretched arm. The common Watershield, the Nelumbium, and the White Water-lily, and also the Mandrake, exhibit this sort of leaf. On comparing the shield-shaped leaf of the common Marsh Pennywort (Fig. 102) with that of another common species (Fig. 101), we see at once what this peculiarity means. A shield-shaped leaf is like a

FIG. 95. Sagittate, 96. auriculate, 97. halberd-shaped, leaves.
FIG. 98 - 102. Various forms of radiate-veined leaves.

kidney-shaped (Fig. 100) or other rounded leaf, with the margins at the base brought together and united.

153. **As to the Apex**, the following terms express the principal variations.

Acuminate, *pointed*, or *taper-pointed*, when the summit is more or less prolonged into a narrowed or tapering point, as in Fig. 97.

Acute, when ending in an acute angle or not prolonged point, as in Fig. 104, 98, 95, &c.

Obtuse, when with a blunt or rounded point, as in Fig. 105, 89, &c.

Truncate, with the end as if cut off square, as in Fig. 106, 94.

Retuse, with the rounded summit slightly indented, forming a very shallow notch, as in Fig. 107.

Emarginate, or *notched*, indented at the end more decidedly, as in Fig. 108.

Obcordate, that is, inversely heart-shaped, where an obovate leaf is more deeply notched at the end (Fig. 109), as in White Clover and Wood-sorrel; so as to resemble a cordate leaf (Fig. 99) inverted.

Cuspidate, tipped with a sharp and rigid point; as in Fig. 110.

Mucronate, abruptly tipped with a small and short point, like a projection of the midrib; as in Fig. 111.

Aristate, *awn-pointed*, and *bristle-pointed*, are terms used when this mucronate point is extended into a longer bristle-form or other slender appendage.

The first six of these terms can be applied to the lower as well as to the upper end of a leaf or other organ. The others belong to the apex only.

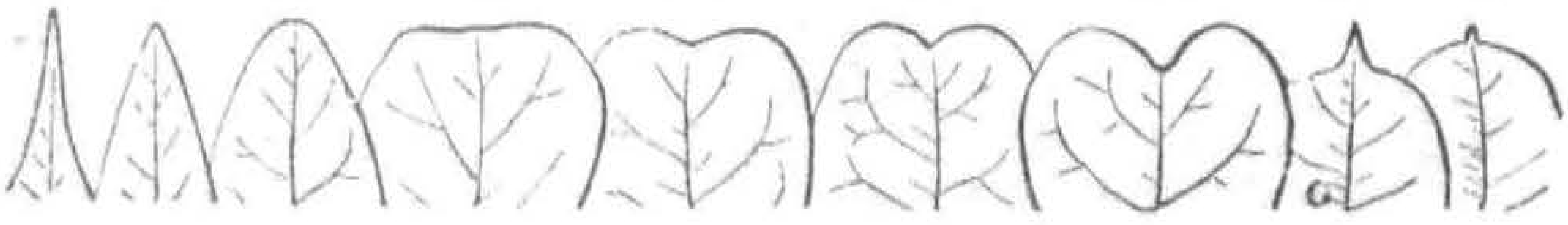


FIG. 103 - 111. Forms of the apex of leaves.

LESSON IX.

MORPHOLOGY OF LEAVES AS FOLIAGE. — SIMPLE AND COMPOUND LEAVES, STIPULES, ETC.

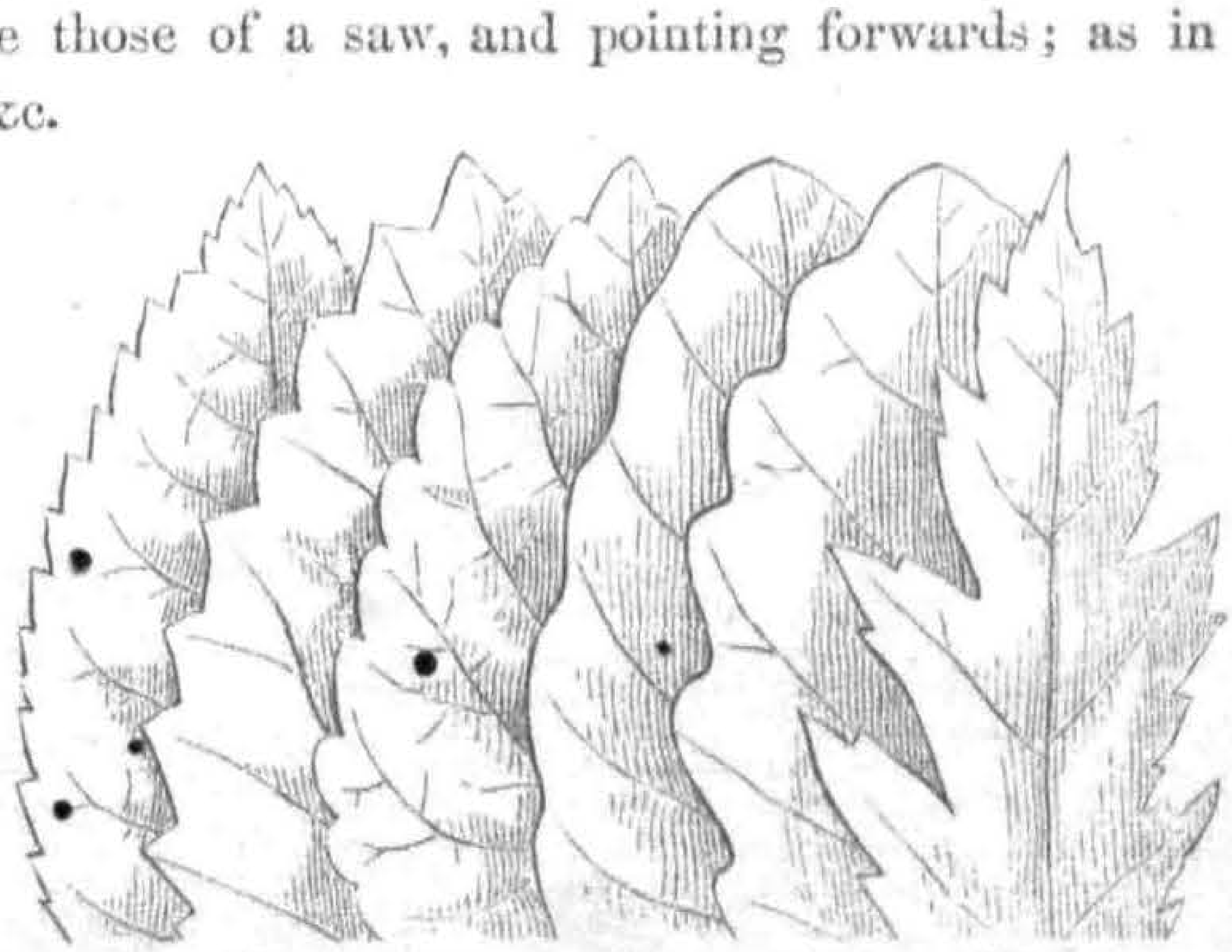
154. In the foregoing Lesson leaves have been treated of in their simplest form, namely, as consisting of a single blade. But in many cases the leaf is divided into a number of separate blades. That is,

155. **Leaves are either Simple or Compound.** They are said to be *simple*, when the blade is all of one piece: they are *compound*, when the blade consists of two or more separate pieces, borne upon a common leaf-stalk. And between these two kinds every intermediate gradation is to be met with. This will appear as we proceed to notice the principal

156. **Forms of Leaves as to particular Outline** or degree of division. In this respect, leaves are said to be

Entire, when their general outline is completely filled out, so that the margin is an even line, without any teeth or notches; as in Fig. 83, 84, 100, &c.

Serrate, or *saw-toothed*, when the margin only is cut into sharp teeth, like those of a saw, and pointing forwards; as in Fig. 112; also 90, &c.



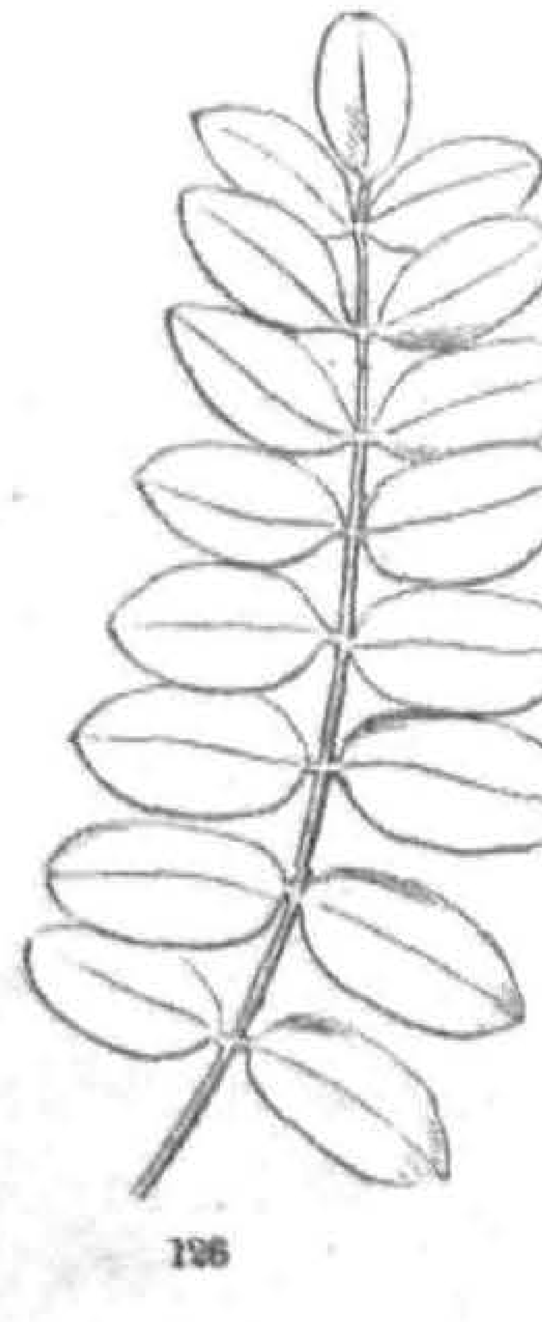
Dentate, or *toothed*, when such teeth point outwards, instead of forwards; as in Fig. 113.

FIG. 112-117. Kinds of margin of leaves.

Sugar-Maple and the Buttonwood (Fig. 50) have *palmately five-lobed leaves;* the Soft White-Maple *palmately five-parted leaves;* and so on. And in the other sort, the Post-Oak has *pinnately seven-* to *nine-lobed leaves;* the Red-Oak commonly has *pinnately seven-* to *nine-cleft leaves,* &c., &c.

162. The divisions, lobes, &c. may themselves be *entire* (without teeth or notches, 156), as in Fig. 118, 122, &c.; or *serrate* (Fig. 124), or otherwise toothed or incised (Fig. 121); or else lobed, cleft, parted, &c.: in the latter cases making *twice pinnatifid, twice palmately* or *pinnately lobed, parted,* or *divided* leaves, &c. From these illustrations, the student will perceive the plan by which the botanist, in two or three words, may describe any one of the almost endlessly diversified shapes of leaves, so as to convey a perfectly clear and definite idea of it.

163. **Compound Leaves.** These, as already stated (155), do not differ in any absolute way from the *divided* form of simple leaves. A compound leaf is one which has its blade in two or more entirely separate parts, each usually with a stalklet of its own: and the stalklet is often *jointed* (or *articulated*) with the main leaf-stalk, just as this is jointed with the stem. When this is the case, there is no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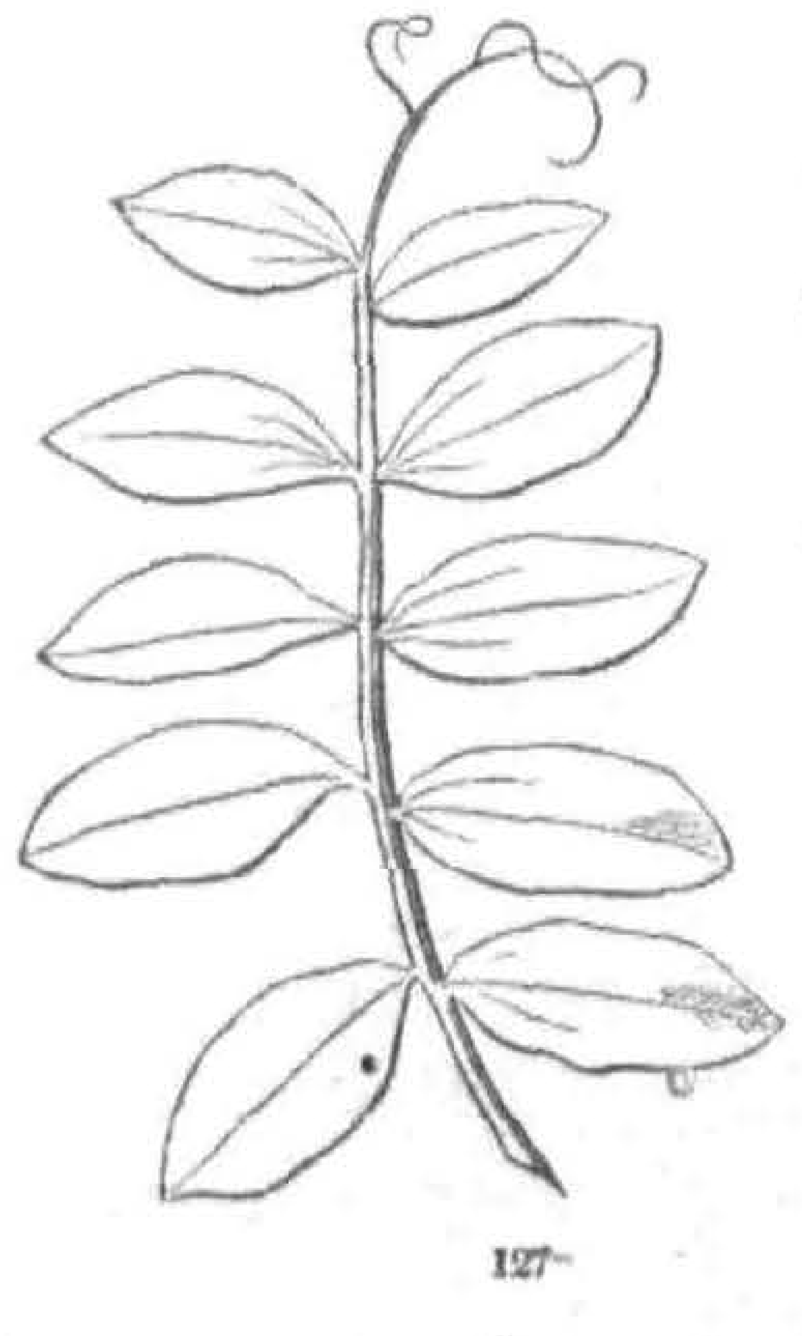
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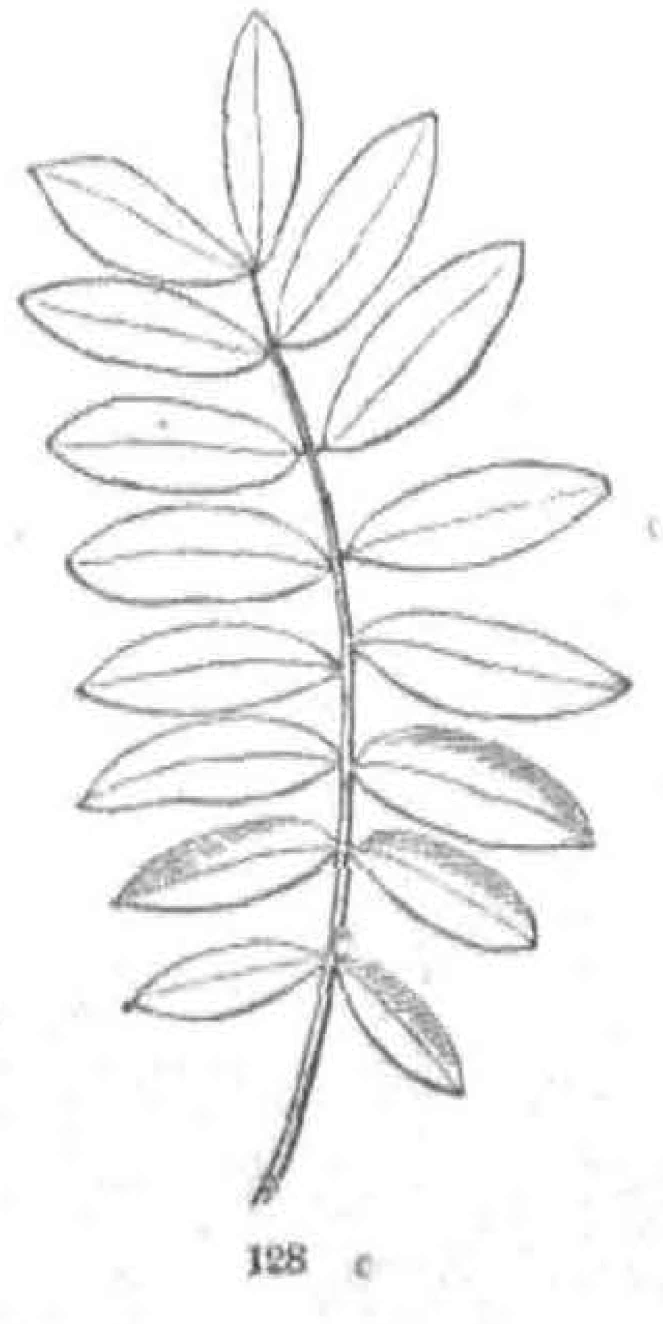
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doubt that the leaf is compound. But when the pieces have no stalklets, and are not jointed with the main leaf-stalk, the leaf may be considered either as simple and divided, or compound, according to the circumstances.

FIG. 126. Pinnate with an odd leaflet, or odd-pinnate. 127. Pinnate with a tendril 128. Abruptly pinnate leaf.

164. The separate pieces or little blades of a compound leaf are called *leaflets*.

165. Compound leaves are of two principal kinds, namely, the *pinnate* and the *palmate ;* answering to the two modes of veining in reticulated leaves (145 – 147), and to the two sorts of lobed or divided leaves (158, 159).

166. *Pinnate* leaves are those in which the leaflets are arranged on the sides of a main leaf-stalk ; as in Fig. 126 – 128. They answer to the *feather-veined* (i. e. *pinnately-veined*) simple leaf ; as will be seen at once, on comparing Fig. 126 with the figures 118 to 121. The *leaflets* of the former answer to the *lobes* or *divisions* of the latter ; and the continuation of the petiole, along which the leaflets are arranged, answers to the midrib of the simple leaf.

167. Three sorts of pinnate leaves are here given. Fig. 126 is *pinnate with an odd or end leaflet*, as in the Common Locust and the Ash. Fig. 127 is *pinnate with a tendril at the end*, in place of the odd leaflet, as in the Vetches and the Pea. Fig. 128 is *abruptly pinnate*, having a pair of leaflets at the end, like the rest of the leaflets ; as in the Honey-Locust.

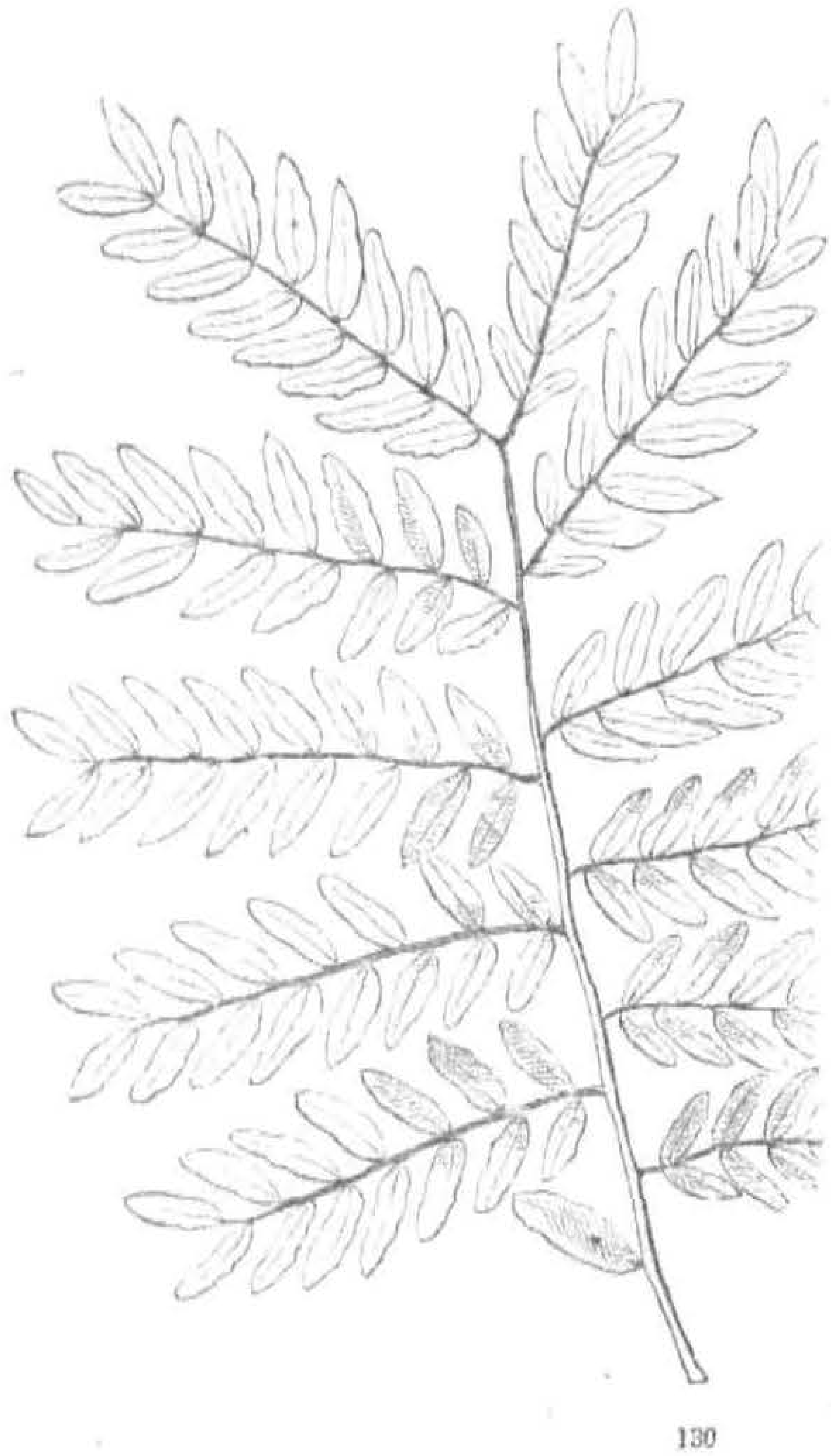
168. *Palmate* (also named *digitate*) leaves are those in which the leaflets are all borne on the very tip of the leaf-stalk, as in the Lupine, the Common Clover (Fig. 136), the Virginia Creeper (Fig. 62), and the Horsechestnut and Buckeye (Fig. 129). They answer to the *radiate-veined* or *palmately-veined* simple leaf ; as is seen by comparing Fig. 136 with the figures 122 to 125. That is, the Clover-leaf of three leaflets is the same as a palmately three-ribbed leaf cut into three separate leaflets. And such a simple five-lobed leaf as that of the Sugar-Maple, if more cut, so as to separate the parts, would produce a palmate leaf of five leaflets, like that of the Horsechestnut or Buckeye (Fig. 129).

129

169. Either sort of compound leaf may have any number of leaflets ; though palmate leaves cannot well have a great many, since they are all crowded together on the end of the main leaf-stalk.

FIG. 129. Palmate leaf of five leaflets, of the Sweet Buckeye.

Some Lupines have nine or eleven; the Horsechestnut has seven, the Sweet Buckeye more commonly five, the Clover three. A pinnate leaf often has only seven or five leaflets, as in the Wild Bean or Groundnut; and in the Common Bean it has only three; in some rarer cases only two; in the Orange and Lemon only one! The joint at the place where the leaflet is united with the petiole alone distinguishes this last case from a simple leaf.*



130

170. The leaflets of a compound leaf may be either *entire* (as in Fig. 126 – 128), or *serrate*, or lobed, cleft, parted, &c.: in fact, they may present all the variations of simple leaves, and the same terms equally apply to them.

171. When this division is carried so far as to separate what would be one leaflet into two, three, or several, the leaf becomes *doubly* or *twice compound*, either *pinnately* or *palmately*, as the case may be. For example, while some of the leaves of the Honey-Locust are *simply pinnate*, that is, *once pinnate*, as in Fig. 128, the greater part

* When the botanist, in describing leaves, wishes to express the number of leaflets, he may use terms like these: —

Unifoliolate, for a compound leaf of a single leaflet; from the Latin *unum*, one, and *foliolum*, leaflet.

Bifoliolate, of two leaflets, from the Latin *bis*, twice, and *foliolum*, leaflet.

Trifoliolate (or *ternate*), of three leaflets, as the Clover; and so on.

When he would express in one phrase both the number of leaflets and the way the leaf is compound, he writes: —

Palmately bifoliolate, trifoliolate, plurifoliolate (of several leaflets), &c., or else

Pinnately bi-, tri-, quadri-, or *pluri-foliolate* (that is, of two, three, four, five, or several leaflets), as the case may be.

FIG. 130. A twice-pinnate (abruptly) leaf of the Honey-Locust.

are *bipinnate*, i. e. *twice pinnate*, as in Fig. 130. If these leaflets were again divided in the same way, the leaf would become *thrice pinnate*, or *tripinnate*, as in many Acacias. The first divisions are called *pinnæ;* the others, *pinnules;* and the last, or little blades, *leaflets*.

172. So the palmate leaf, if again compounded in the same way, becomes *twice palmate*, or, as we say when the divisions are in threes, *twice ternate* (in Latin form *biternate*); if a third time compounded, *thrice ternate* or *triternate*. But if the division goes still further, or if the degree is variable, we simply say that the leaf is *decompound;* either palmately or pinnately so, as the case may be. Thus, Fig. 138 represents a four times ternately compound, in other words a *ternately decompound*, leaf of our common Meadow Rue.

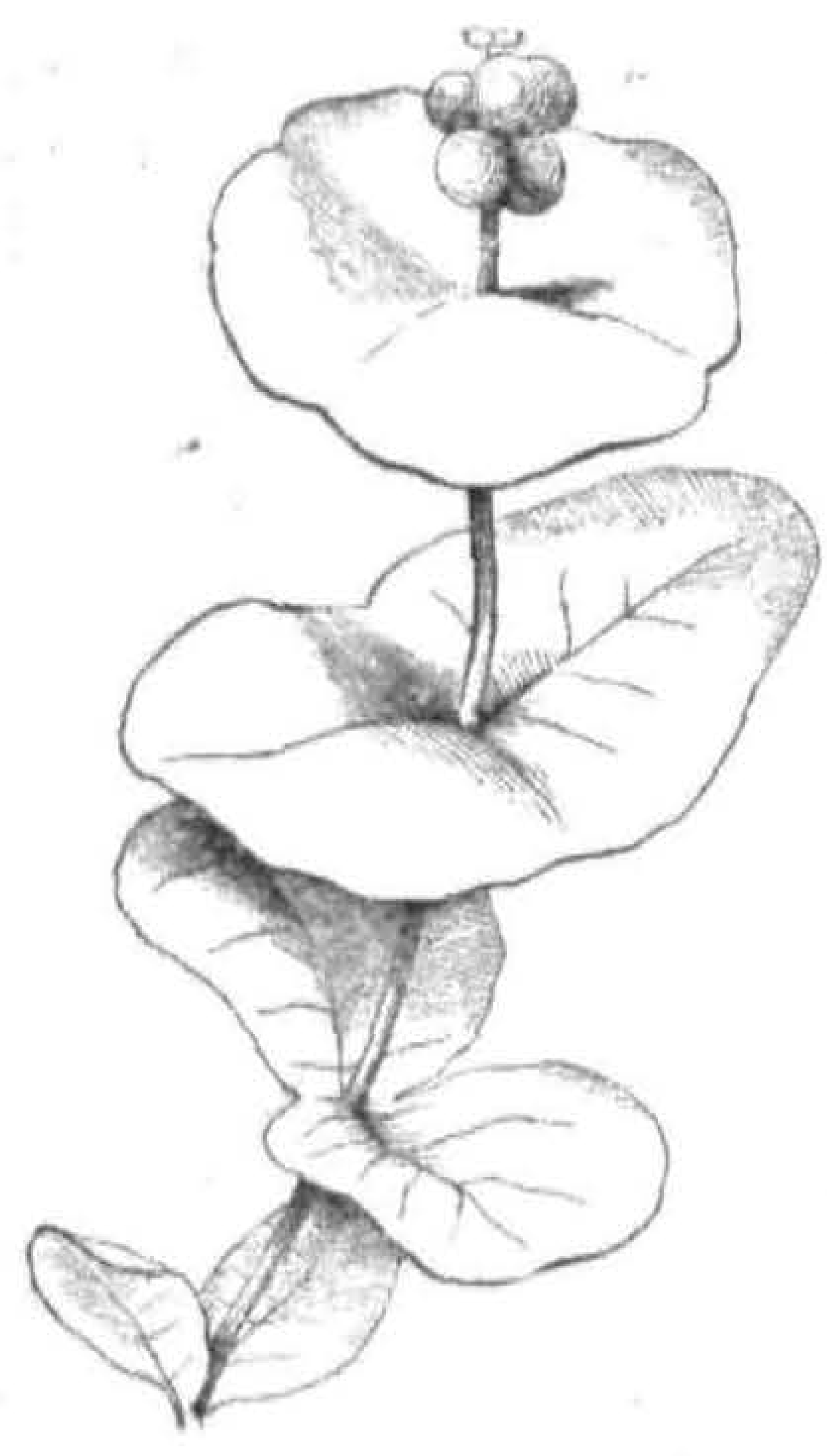
173. So exceedingly various are the kinds and shapes of leaves, that we have not yet exhausted the subject. We have, however, mentioned the principal terms used in describing them. Many others will be found in the glossary at the end of the volume. Some peculiar sorts of leaves remain to be noticed, which the student might not well understand without some explanation; such as

174. **Perfoliate Leaves.** A common and simple case of this sort is found in two species of Uvularia or Bellwort, where the stem appears to run through the blade of the leaf, near one end. If we look at this plant in summer, after all the leaves are formed, we may see the meaning of this at a glance. For then we often find upon the same stem such a series of leaves as is given in Fig. 131: the lower leaves are *perfoliate*, those next above less so; then some (the fourth and fifth) with merely a heart-shaped clasping base, and finally one that is merely *sessile*. The leaf, we perceive, becomes perfoliate by the union of the edges of the base with each other around the stem; just as the shield-shaped leaf, Fig. 102, comes from the union of the edges of the base of such a leaf as Fig. 101. Of the same sort are the upper leaves of most of

131

FIG. 131. Leaves of Uvularia (Bellwort); the lower ones perfoliate, the others merely clasping, or the uppermost only sessile.

the true Honeysuckles (Fig. 132): but here it is a pair of opposite leaves, with their contiguous broad bases grown together, which makes what seems to be one round leaf, with the stem running through its centre. This is seen to be the case, by comparing together the upper and the lowest leaves of the same branch. Leaves of this sort are said to be *connate-perfoliate*.



132

175. **Equitant Leaves.** While ordinary leaves spread horizontally, and present one face to the sky and the other to the earth, there are some that present their tip to the sky, and their faces right and left to the horizon. Among these are the *equitant* leaves of the Iris or Flower-de-Luce. On careful inspection we shall find that each leaf was formed *folded together lengthwise*, so that what would be the upper surface is within, and all grown together, except next the bottom, where each leaf covers the next younger one. It was from their straddling over each other, like a man on horseback (as is seen in the cross-section, Fig. 134), that Linnæus, with his lively fancy, called these *equitant* leaves.

176. **Leaves with no distinction of Petiole and Blade.** The leaves of Iris just mentioned show one form of this. The flat but narrow leaves of Jonquils, Daffodils, and the like, are other instances. *Needle-shaped* leaves, like those of the Pine (Fig. 140), Larch (Fig. 139), and Spruce, and the *awl-shaped* as well as the *scale-shaped* leaves of Junipers, Red Ce-

134

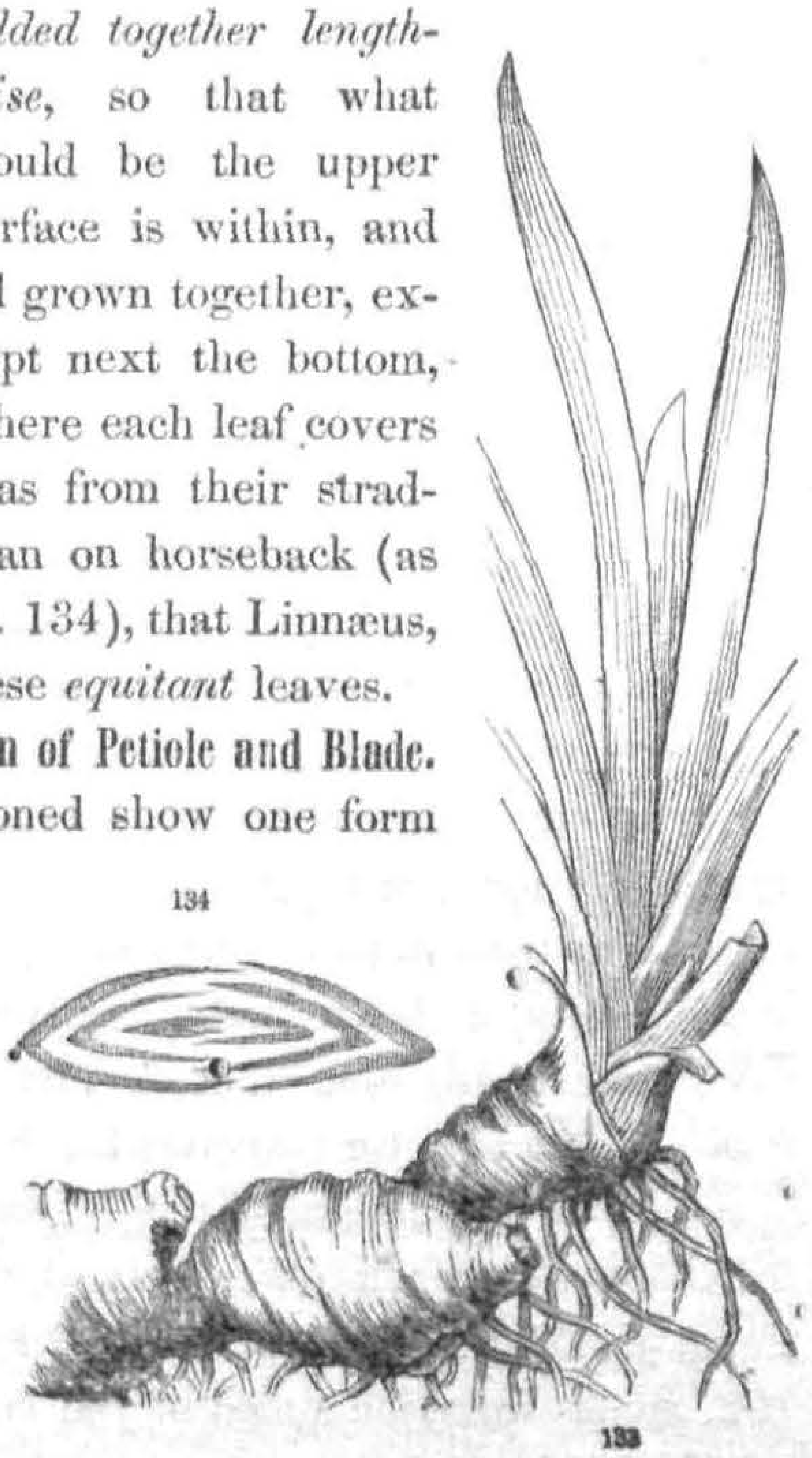


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FIG. 132. Branch of a Yellow Honeysuckle, with connate-perfoliate leaves.

FIG. 133. Rootstock and equitant leaves of Iris. 134. A section across the cluster of leaves at the bottom.

dar, and Arbor-Vitæ (Fig. 135), are different examples. These last are leaves serving for foliage, but having as little spread of surface as possible. They make up for this, however, by their immense numbers.

135

177. Sometimes the *petiole* expands and flattens, and takes the place of the blade; as in numerous New Holland Acacias, some of which are now common in greenhouses. Such counterfeit blades are called *phyllodia*, — meaning leaf-like bodies. They may be known from true blades by their standing edgewise, their margins being directed upwards and downwards; while in true blades the faces look upwards and downwards; excepting in equitant leaves, as already explained, and in those which are turned edgewise by a twist, such as those of the Callistemon or Bottle-brush Flower of our greenhouses, and other Dry Myrtles of New Holland, &c.

178. **Stipules**, the pair of appendages which is found at the base of the petiole in many leaves (133), should also be considered in respect to their very varied forms and appearances. More commonly they appear like little blades, on each side of the leaf-stalk, as in the Quince (Fig. 83), and more strikingly in the Hawthorn and in the Pea. Here they remain as long as the rest of the leaf, and serve for the same purpose as the blade. Very commonly they serve for bud-scales, and fall off when the leaves expand, as in the Fig-tree, and the Magnolia (where they are large and conspicuous), or soon

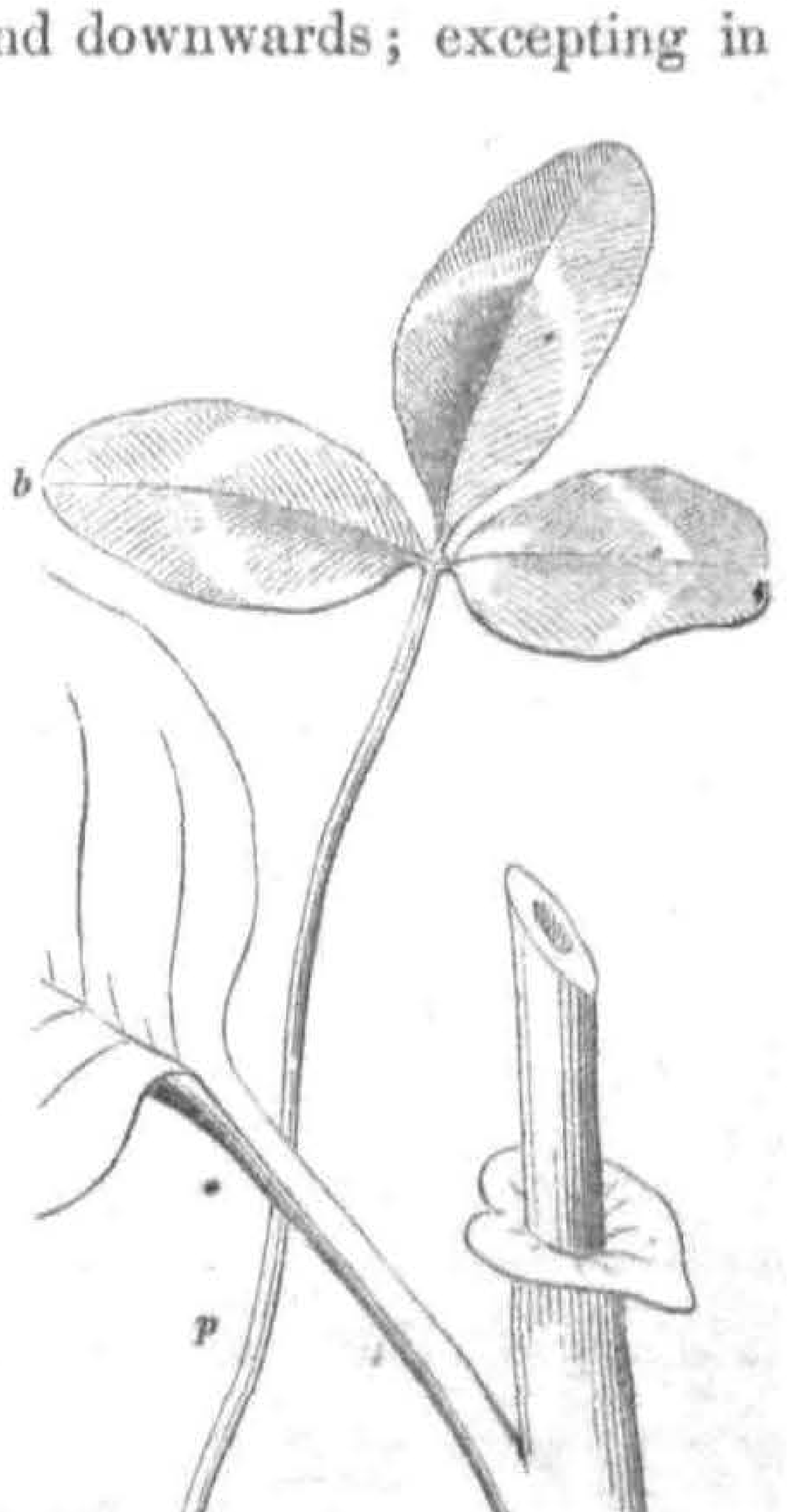

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FIG. 135. Twig of Arbor-Vitæ, with its two sorts of leaves: viz. some awl-shaped, the others scale-like; the latter on the branchlets, *a*.

FIG. 136. Leaf of Red Clover: *st*, stipules, adhering to the base of *p*, the petiole: *b*, blade of three leaflets.

FIG. 137. Part of stem and leaf of Prince's-Feather (Polygonum orientale) with the united sheathing stipules forming a sheath.

afterwards, as in the Tulip-tree. In the Pea the stipules make a very conspicuous part of the leaf; while in the Bean they are quite small; and in the Locust they are reduced to bristles or prickles. Sometimes the stipules are separate and distinct (Fig. 83): often they are united with the base of the leaf-stalk, as in the Rose and the Clover (Fig. 136): and sometimes they grow together by both margins, so as to form a sheath around the stem, above the leaf, as in the Buttonwood, the Dock, and almost all the plants of the Polygonum Family (Fig. 137).

179. The sheaths of Grasses bear the blade on their summit, and therefore represent a form of the petiole. The small and thin appendage which is commonly found at the top of the sheath (called a *ligule*) here answers to the stipule.

FIG. 138. Ternately-decompound leaf of Meadow Rue (Thalictrum Cornuti).

LESSON X.

THE ARRANGEMENT OF LEAVES.

180. UNDER this head we may consider, — 1. the arrangement of leaves on the stem, or what is sometimes called PHYLLOTAXY (from two Greek words meaning *leaf-order*); and 2. the ways in which they are packed together in the bud, or their VERNATION (the word meaning their spring state).

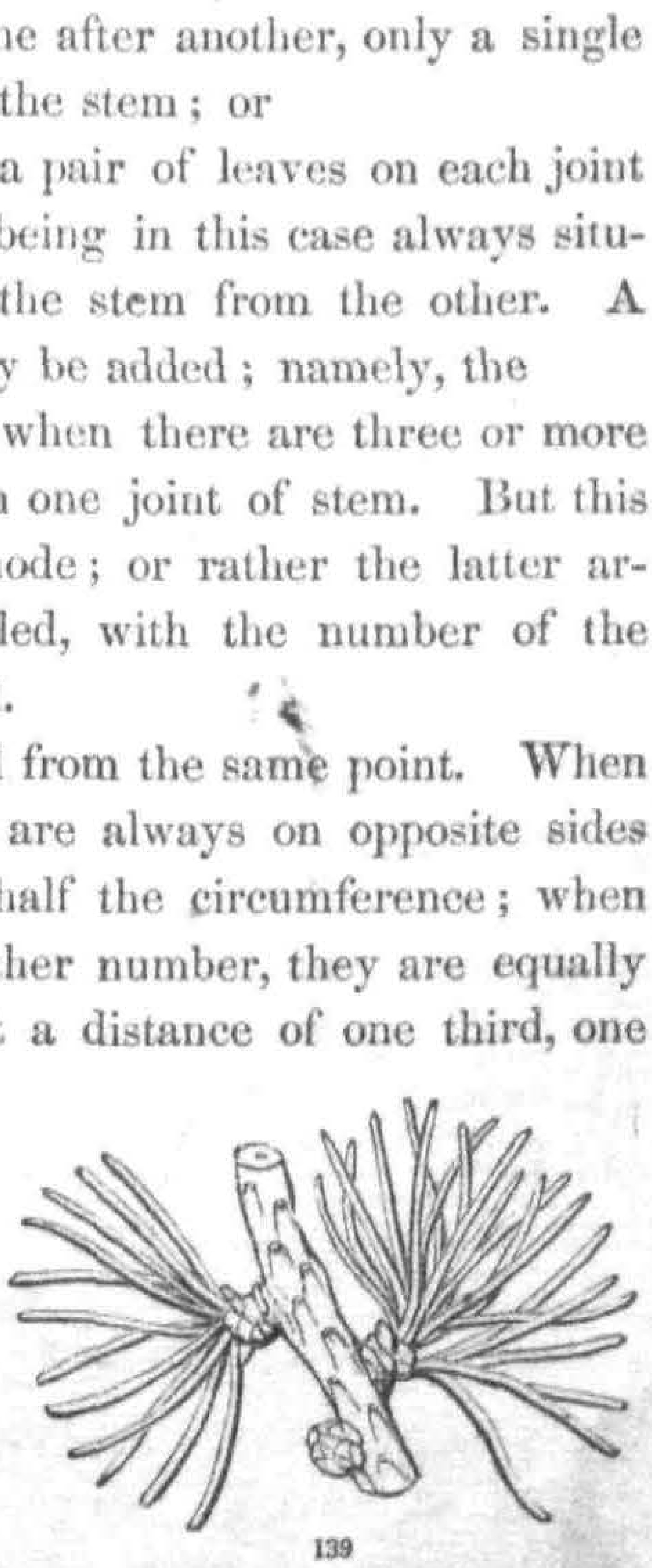
181. **Phyllotaxy.** As already explained (48, 49), leaves are arranged on the stem in two principal ways. They are either

Alternate (Fig. 131, 143), that is, one after another, only a single leaf arising from each node or joint of the stem; or

Opposite (Fig. 147), when there is a pair of leaves on each joint of the stem; one of the two leaves being in this case always situated exactly on the opposite side of the stem from the other. A third, but uncommon arrangement, may be added; namely, the

Whorled, or *verticillate* (Fig. 148), when there are three or more leaves in a circle (*whorl* or *verticil*) on one joint of stem. But this is only a variation of the opposite mode; or rather the latter arrangement is the same as the whorled, with the number of the leaves reduced to two in each whorl.

182. Only one leaf is ever produced from the same point. When two are borne on the same joint, they are always on opposite sides of the stem, that is, are separated by half the circumference; when in whorls of three, four, five, or any other number, they are equally distributed around the joint of stem, at a distance of one third, one fourth, or one fifth of the circumference from each other, according to their number. So they always have the greatest possible divergence from each other. Two or more leaves belonging to the same joint of stem never stand side by side, or one above the other, in a cluster.



139

183. What are called *clustered* or *fascicled* leaves, and which

afterwear to be so, are always the leaves of a whole branch which very hains so very short that they are all crowded together in a smalindle or rosette; as in the spring leaves of the Barberry and of Sothe Larch (Fig. 139). In these cases an examination shows them h to be nothing else than alternate leaves, very much crowded on a short spur; and some of these spurs are seen in the course of the season to lengthen into ordinary shoots with scattered alternate leaves. So, likewise, each cluster of two or three needle-shaped leaves in Pitch Pines (as in Fig. 140), or of five leaves in White Pine, answers to a similar, extremely short branch, springing from the axil of a thin and slender scale, which represents a leaf of the main shoot. For Pines produce two kinds of leaves; — 1. primary, the proper leaves of the shoots, not as foliage, but in the shape of delicate scales in spring, which soon fall away; and 2. secondary, the *fascicled* leaves, from buds in the axils of the former, and these form the actual foliage.

140

184. **Spiral Arrangement of Leaves.** If we examine any alternate-leaved stem, we shall find that the leaves are *placed upon it in symmetrical order, and in* a way perfectly uniform for each species, but different in different plants. If we draw a line from the *insertion* (i. e. the point of attachment) of one leaf to that of the next, and so on, this line will wind spirally around the stem as it rises, and in the same species will always have just the same number of leaves upon it for each turn round the stem. That is, any two successive leaves will always be separated from each other by just an equal portion of the circumference of the stem. The distance in *height* between any two leaves may vary greatly, even on the same shoot, for that depends upon the length of the *internodes* or spaces between each leaf; but the distance as measured around the circumference (in other words, the *angular divergence*, or angle formed by any two successive leaves) is uniformly the same.

185. The greatest possible divergence is, of course, where the second leaf stands on exactly the opposite side of the stem from the first, the third on the side opposite the second, and therefore over the

FIG. 140. Piece of a branchlet of Pitch Pine, with three leaves in a fascicle or bundle, in the axil of a thin scale which answers to a primary leaf. The bundle is surrounded at the base by a short sheath, formed of the delicate scales of the axillary bud.

first, and the fourth over the second. This brings all the leaves into two ranks, one on one side of the stem and one on the other; and is therefore called the *two-ranked* arrangement. It occurs in all Grasses, — in Indian Corn, for instance; also in the Spiderwort, the Bellwort (Fig. 131) and Iris (Fig. 132), in the Basswood or Lime-tree, &c. This is the simplest of all arrangements.

186. Next to this is the *three-ranked* arrangement, such as we see in Sedges, and in the Veratrum or White Hellebore. The plan of it is shown on a Sedge in Fig. 141, and in a diagram or cross-section underneath, in Fig. 142. Here the second leaf is placed one third of the way round the stem, the third leaf two thirds of the way round, the fourth leaf accordingly directly over the first, the fifth over the second, and so on. That is, three leaves occur in each turn round the stem, and they are separated from each other by one third of the circumference.

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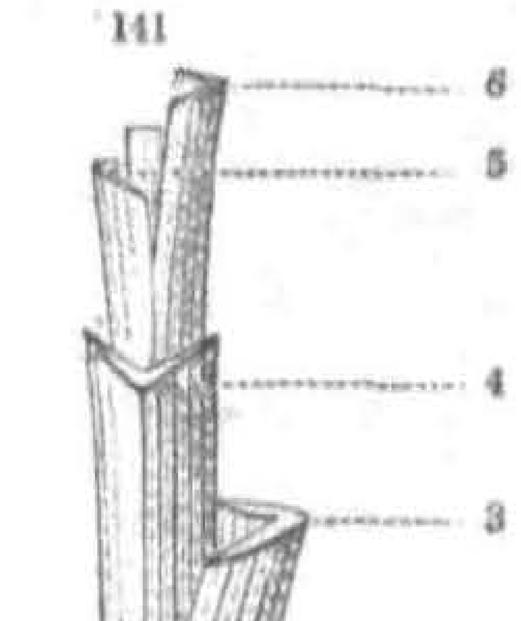
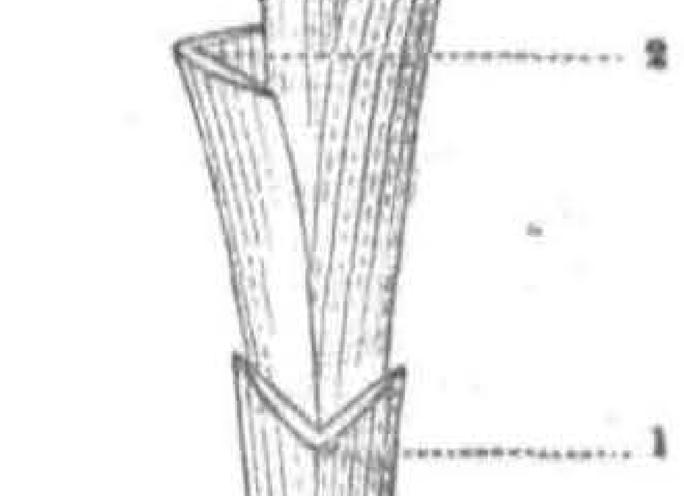


187. The next and one of the most common is the *five-ranked* arrangement; which is seen in the Apple (Fig. 143), Cherry, Poplar, and the greater part of our trees and shrubs. In this case the line traced from leaf to leaf will pass twice round the stem before it reaches a leaf situated directly over any below (Fig. 144). Here the sixth leaf is over the first; the leaves stand in five perpendicular ranks, equally distant from each other; and the distance between any two successive leaves is just two fifths of the circumference of the stem.



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188. The five-ranked arrangement is expressed by the fraction $\frac{2}{5}$. This fraction denotes the divergence of the successive leaves, i. e. the angle they form with each other: the numerator also expresses the number of turns made round the stem by the spiral line in completing one cycle or set of leaves, namely 2; and the denominator gives the number of leaves in each cycle, or the number of perpendicular

FIG. 141. Piece of the stalk of a Sedge, with the leaves cut away, leaving their bases; the leaves are numbered in order, from 1 to 6. 142. Diagram or cross-section of the same, all in one plane: the leaves similarly numbered.

by the midrib so that the two halves are placed face to face, it is *conduplicate* (Fig. 149), as in the Magnolia, the Cherry, and the Oak: when folded back and forth like the plaits of a fan, it is *plicate* or *plaited* (Fig. 150), as in the Maple and Currant. If rolled, it may be so either from the tip downwards, as in Ferns and the Sundew (Fig. 154), when in unrolling it resembles the head of a crosier, and is said to be *circinate;* or it may be rolled up parallel with the axis, either from one edge into a coil, when it is *convolute* (Fig. 151), as in the Apricot and Plum, or rolled from both edges towards the midrib; — sometimes inwards, when it is *involute* (Fig. 152), as in the Violet and Water-Lily; sometimes outwards, when it is *revolute* (Fig. 153), in the Rosemary and Azalea. The figures are diagrams, representing sections through the leaf, in the way they were represented by Linnæus.

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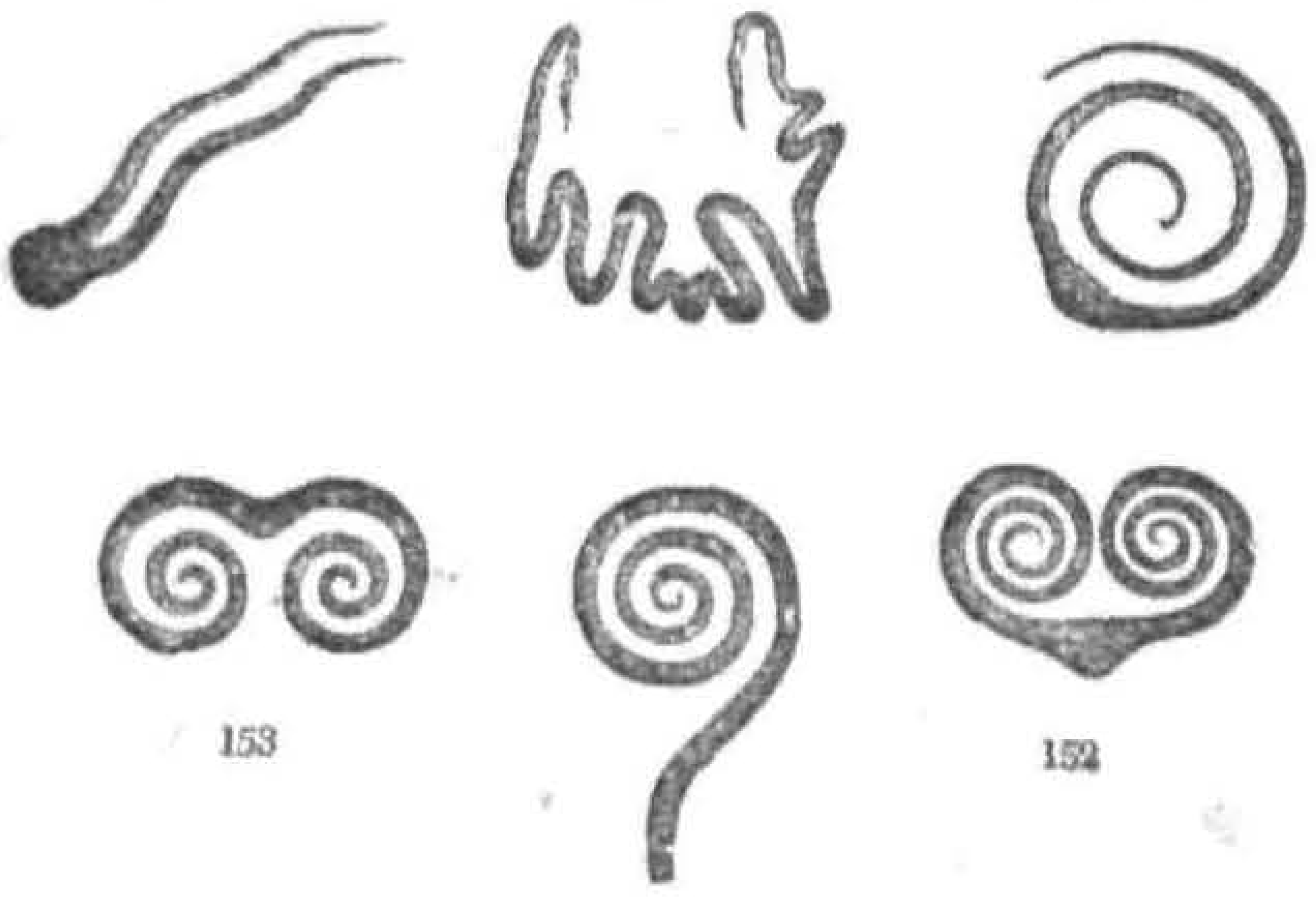


153 152

154

LESSON XI.

THE ARRANGEMENT OF FLOWERS ON THE STEM, OR INFLORESCENCE.

195. THUS far we have been considering the *vegetation* of the plant, and studying those parts, viz. root, stem, and leaves, by which it increases in size and extent, and serves the purpose of its individual life. But after a time each plant produces a different set of organs, — viz. flowers, fruit, and seed, — subservient to a different purpose, that is, the increase in numbers, or the continuance of the

species. The plant reproduces itself in new individuals by seed. Therefore the *seed*, and the *fruit* in which the seed is formed, and the *flower*, from which the fruit results, are named the *Organs of Reproduction* or *Fructification*. These we may examine in succession. We begin, of course, with the flower. And the first thing to consider is the

196. **Inflorescence**, or the mode of flowering, that is, the situation and arrangement of blossoms on the plant. Various as this arrangement may seem to be, all is governed by a simple law, which is easily understood. As the position of every leaf is fixed beforehand by a mathematical law which prescribes where it shall stand (192), so is that of every blossom; — and by the same law in both cases. For flowers are buds, developed in a particular way; and flower-buds occupy the position of leaf-buds, and no other. As leaf-buds are either terminal (at the summit of a stem or branch, 42), or axillary (in the axil of a leaf, 43), so likewise

197. Flowers are either *terminal* or *axillary*. In blossoming as in vegetation we have only buds terminating (i. e. on the summit of) stems or branches, and buds from the axils of leaves. But while the same plant commonly produces both kinds of leaf-buds, it rarely bears flowers in both situations. These are usually either all axillary or all terminal; — giving rise to two classes of inflorescence, viz. the *determinate* and the *indeterminate*.

198. **Indeterminate Inflorescence** is that where the flowers all arise from axillary buds; as in Fig. 155, 156, 157, &c.; and the reason why it is called indeterminate (or *indefinite*) is, that while the axillary buds give rise to flowers, the terminal bud goes on to grow, and continues the stem indefinitely.

155

199. Where the flowers arise, as in Fig. 155, singly from the axils of the ordinary leaves of the plant, they do not form flower-clusters, but are *axillary* and *solitary*. But when several or many flowers are produced near each other, the accompanying leaves are usually of smaller size, and often of a different shape or character: then they are called *bracts*; and the flowers thus brought together

FIG. 155 Moneywort (Lysimachia nummularia) of the gardens, with axillary flowers.

form one cluster or inflorescence. The sorts of inflorescence of the indeterminate class which have received separate names are chiefly the following: viz. the *Raceme*, the *Corymb*, the *Umbel*, the *Spike*, the *Head*, the *Spadix*, the *Catkin*, and the *Panicle*.

200. Before illustrating these, one or two terms, of common occurrence, may be defined. A flower (or other body) which has no stalk to support it, but which sits directly on the stem or axis it proceeds from, is said to be *sessile*. If it has a stalk, this is called its *peduncle*. If the whole flower-cluster is raised on a stalk, this is called the peduncle, or the *common peduncle* (Fig. 156, *p*); and the stalk of each particular flower, if it have any, is called the *pedicel* or *partial peduncle* (*p'*). The portion of the general stalk along which flowers are disposed is called the *axis of inflorescence*, or, when covered with sessile flowers, the *rhachis* (back-bone), and sometimes the *receptacle*. The leaves of a flower-cluster generally are termed *bracts*. But when we wish particularly to distinguish them, those on the peduncle, or main axis, and which have a flower in their axil, take the name of *bracts* (Fig. 156, *b*); and those on the pedicels or partial flower-stalks, if any, that of *bractlets* (Fig. 156, *b'*).

156

201. A **Raceme** (Fig. 156, 157) is that form of flower-cluster in which the flowers, each on their own foot-stalk or pedicel, are arranged along a common stalk or axis of inflorescence; as in the Lily of the Valley, Currant, Choke-Cherry, Barberry, &c. Each flower comes from the axil of a small leaf, or bract, which, however, is often so small that it might escape notice, and which sometimes (as in the Mustard Family) disappears altogether. The lowest blossoms of a raceme are of course the oldest, and therefore open first, and the order of blossoming is *ascending*, from the bottom to the top. The summit, never being stopped by a terminal flower, may go on to grow, and often does so (as in the common Shepherd's Purse), producing lateral flowers one after another the whole summer long.

202. All the various kinds of flower-clusters pass one into another

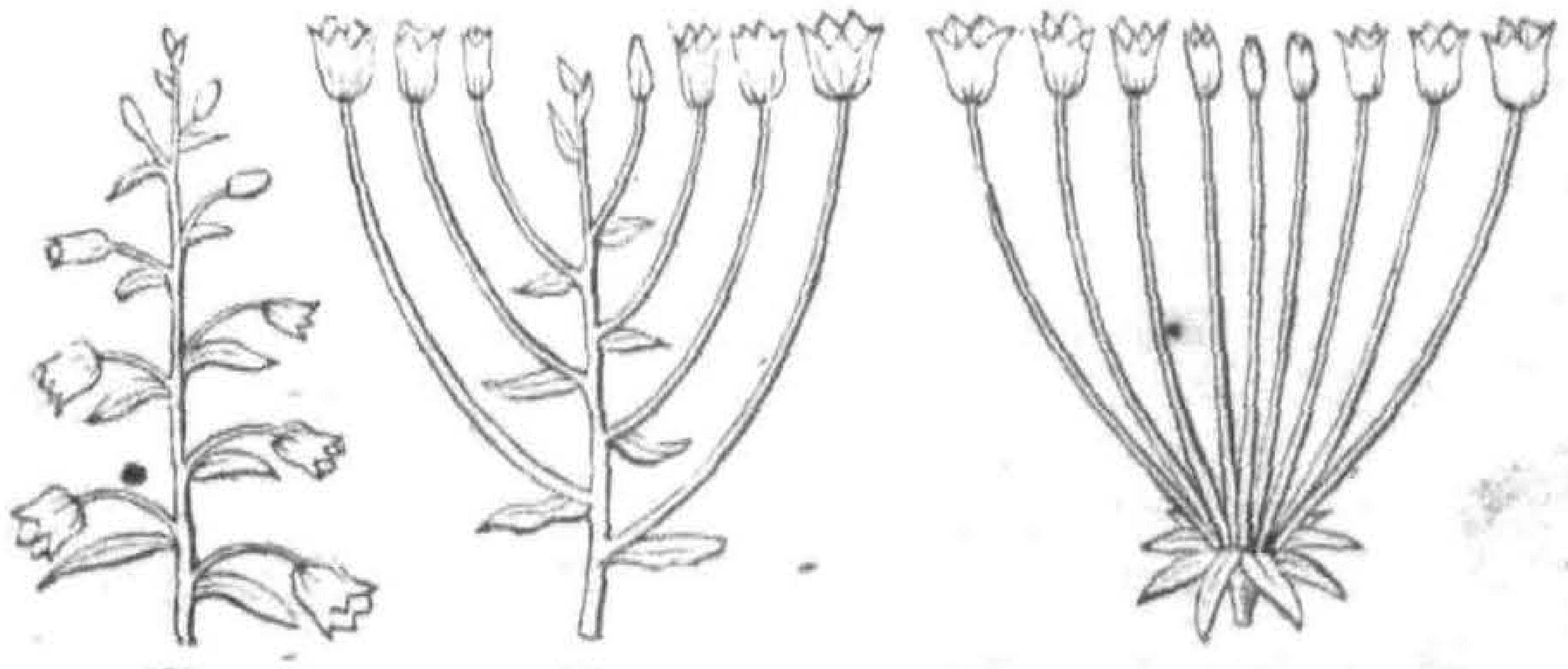
FIG. 156 A Raceme, with a general peduncle (*p*), pedicels (*p'*), bracts (*b*), and bractlets (*b'*).

by intermediate gradations of every sort. For instance, if we lengthen the lower pedicels of a raceme, and keep the main axis rather short, it is converted into

203. **A Corymb** (Fig. 158). This is the same as a raceme, except that it is flat and broad, either convex, or level-topped, as in the Hawthorn, owing to the lengthening of the lower pedicels while the uppermost remain shorter.

204. The main axis of a corymb is short, at least in comparison with the lower pedicels. Only suppose it to be so much contracted that the bracts are all brought into a cluster or circle, and the corymb becomes

205. **An Umbel** (Fig. 159), — as in the Milkweed and Primrose, — a sort of flower-cluster where the pedicels all spring apparently from the same point, from the top of the peduncle, so as to resemble, when spreading, the rays of an umbrella, whence the name. Here the pedicels are sometimes called the *rays* of the umbel. And the bracts, when brought in this way into a cluster or circle, form what is called an *involucre*.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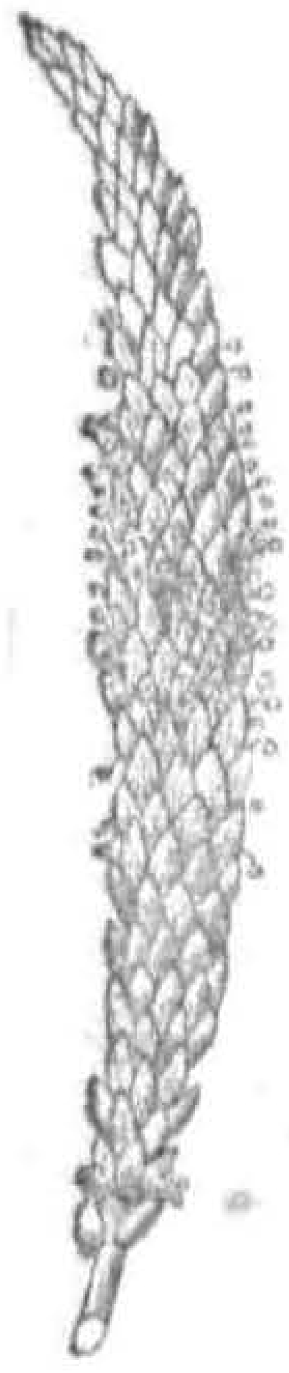
206. For the same reason that the order of blossoming in a raceme is ascending (201), in the corymb and umbel it is *centripetal*, that is, it proceeds from the margin or circumference regularly towards the centre; the lower flowers of the former answering to the outer ones of the latter. Indeterminate inflorescence, therefore, is said to be centripetal in evolution. And by having this order of blossoming, all the sorts may be distinguished from those of the other, or the determinate class. In all the foregoing cases the flowers are raised on pedicels. These, however, are very short in many instances, or are wanting altogether; when the flowers are *sessile* (200). They are so in

FIG. 157. A raceme. 158. A corymb. 159. An umbel.

207. **The Spike.** This is a flower-cluster with a more or less lengthened axis, along which the flowers are sessile or nearly so; as in the Mullein and the Plantain (Fig. 160). It is just the same as a raceme, therefore, without any pedicels to the flowers.



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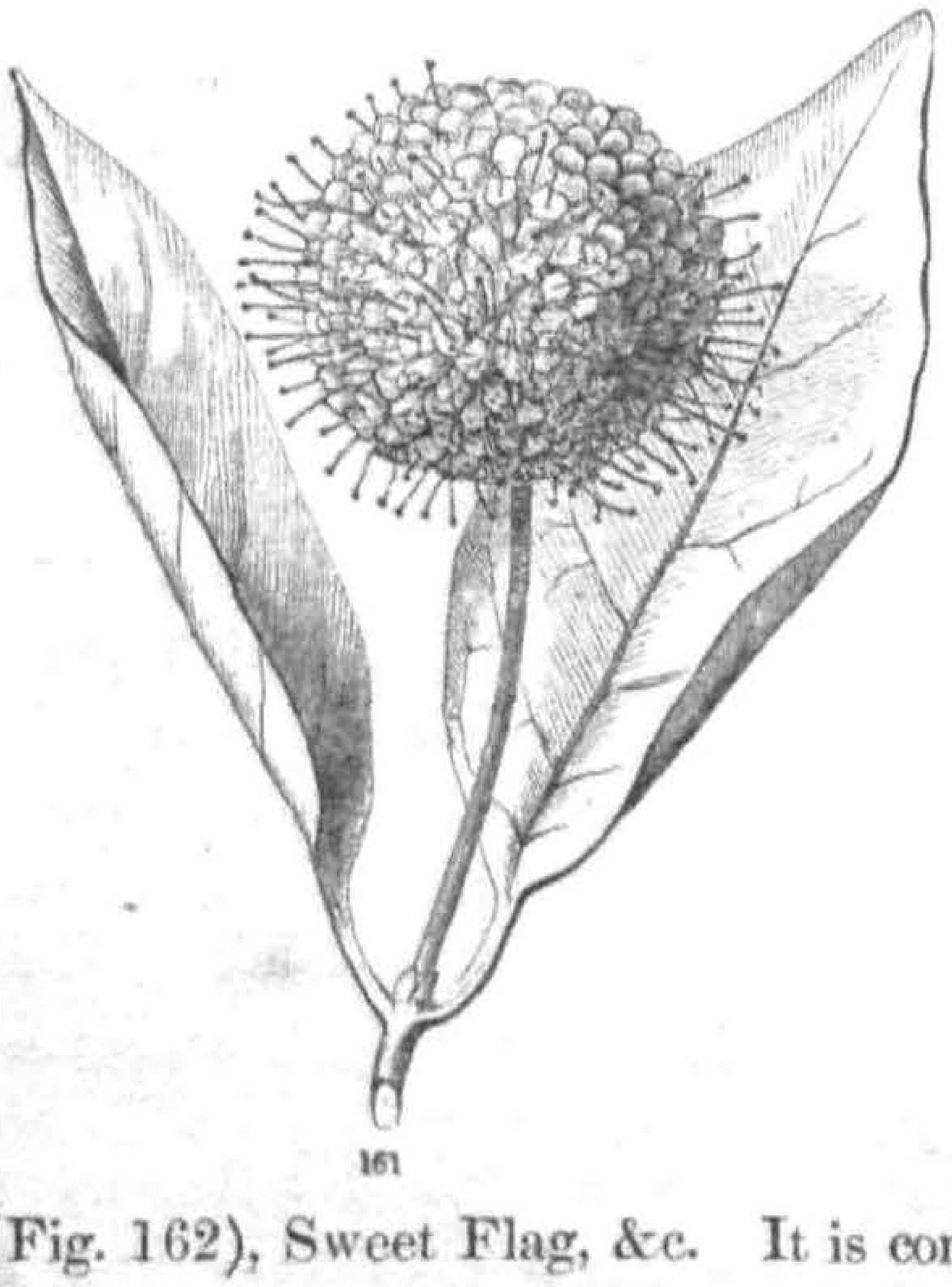
208. **The Head** is a round or roundish cluster of flowers which are sessile on a very short axis or receptacle, as in the Button-ball, Button-bush (Fig. 161), and Red Clover. *It is just what a spike would become if its axis were shortened; or an umbel, if its pedicels were all shortened until the flowers became sessile or apparently so.* The head of the Button-bush (Fig. 161) is naked; but that of the Thistle, of the Dandelion, the Cichory (Fig. 221), and the like, is surrounded by empty bracts, which form an *involucre.* Two particular forms of the spike and the head have received particular names, namely, the *Spadix* and the *Catkin.*

209. **A Spadix** is nothing but a fleshy spike or head, with small and often imperfect flowers, as in the Calla, the Indian Turnip



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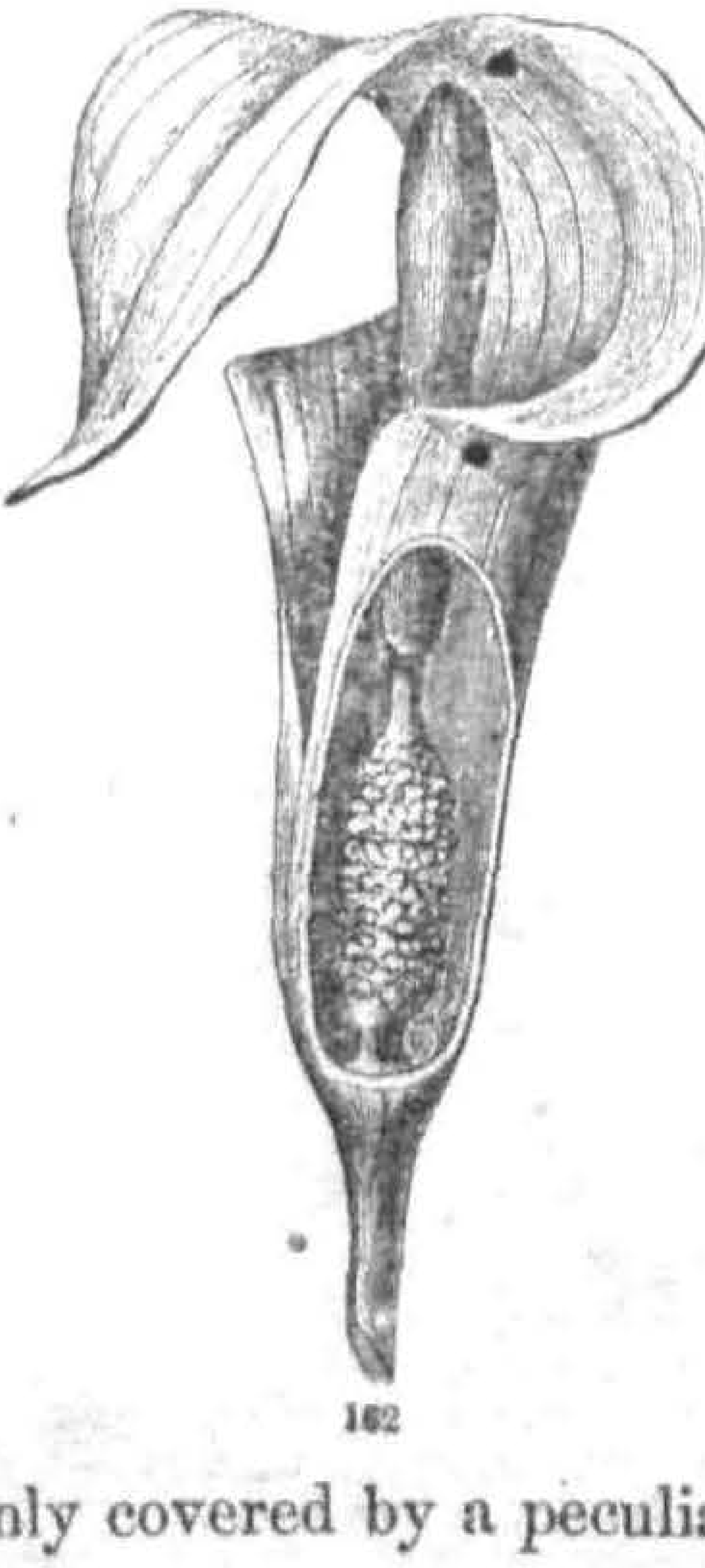


162

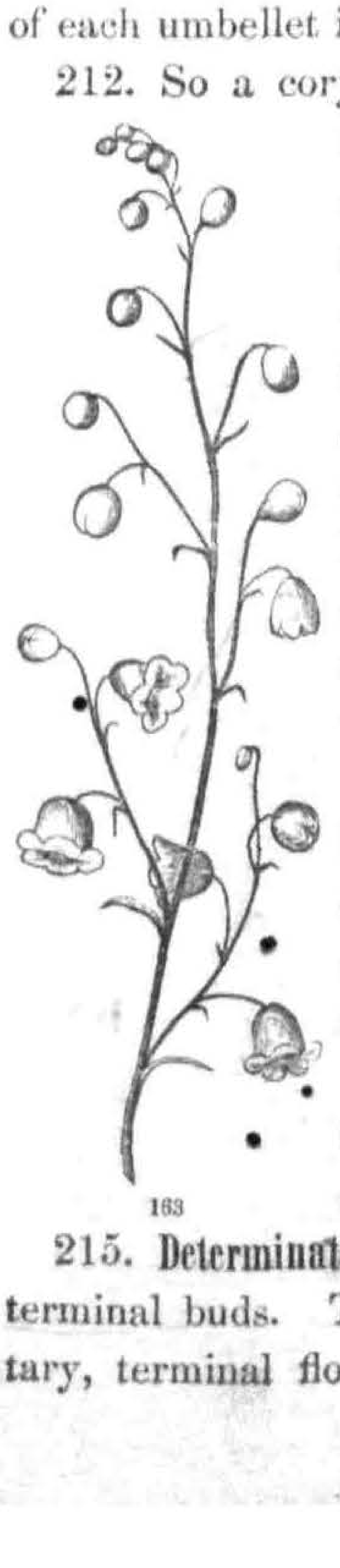
(Fig. 162), Sweet Flag, &c. It is commonly covered by a peculiar enveloping leaf, called a *spathe.*

FIG. 160. Spike of the common Plantain or Ribwort.
FIG. 161. Head of the Button-bush (Cephalanthus).
FIG. 162. Spadix and spathe of the Indian Turnip; the latter cut through below.

210. **A Catkin or Ament** is the name given to the scaly sort of spike of the Birch and Alder, the Willow and Poplar, and one sort of flower-clusters of the Oak, Hickory, and the like; — on which account these are called *Amentaceous* trees.

211. Sometimes these forms of flower-clusters become *compound.* For example, the stalks which, in the simple umbel such as has been described (Fig. 159), are the pedicels of single flowers, may themselves branch in the same way at the top, and so each become the support of a smaller umbel; as is the case in the Parsnip, Caraway, and almost the whole of the great family of what are called *Umbelliferous* (i. e. umbel-bearing) plants. Here the whole is termed a *compound umbel;* and the smaller or *partial* umbels take the name in English of *umbellets.* The *general involucre,* at the base of the main umbel, keeps that name; while that at the base of each umbellet is termed a *partial involucre* or an *involucel.*

212. So a corymb (Fig. 158) with its separate stalks branching again, and bearing smaller clusters of the same sort, is a *compound corymb;* of which the Mountain Ash is a good example. A raceme where what would be the pedicels of single flowers become stalks, along which flowers are disposed on their own pedicels, forms a *compound raceme,* as in the Goat's-beard and the False Spikenard. But when what would have been a raceme or a corymb branches irregularly into an open and more or less compound flower-cluster, we have what is called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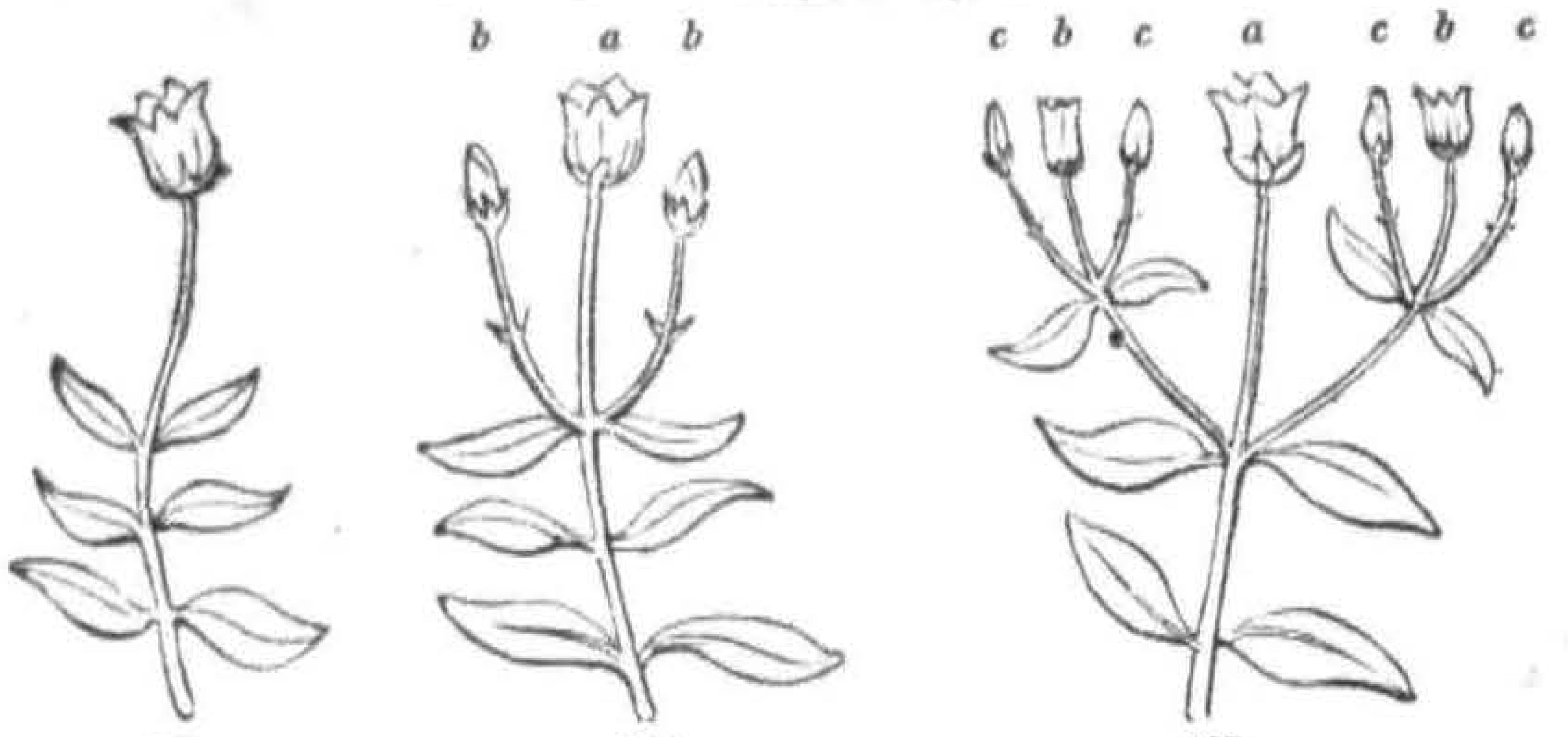
213. **A Panicle** (Fig. 163); as in the Oat and in most common Grasses. Such a raceme as that of the diagram, Fig. 156, would be changed into a panicle like Fig. 163, by the production of a flower from the axil of each of the bractlets *b'*.

214. **A Thyrsus** is a compact panicle of a pyramidal or oblong shape; such as a bunch of grapes, or the cluster of the Lilac or Horsechestnut.

215. **Determinate Inflorescence** is that in which the flowers are from terminal buds. The simplest case is where a stem bears a solitary, terminal flower, as in Fig. 163ª. This stops the growth of

FIG. 163. A Panicle

the stem; for its terminal bud, being changed into a blossom, can no more lengthen in the manner of a leaf-bud. Any further growth



163 a 164 165

must be from axillary buds developing into branches. If such branches are leafy shoots, at length terminated by single blossoms, the inflorescence still consists of solitary flowers at the summit of the stem and branches. But if the flowering branches bear only bracts in place of ordinary leaves, the result is the kind of flower-cluster called

166

216. **A Cyme.** This is commonly a flat-topped or convex flower-cluster, like a corymb, only the blossoms are from terminal buds. Fig. 164 illustrates the simplest cyme in a plant with opposite leaves, namely, with three flowers. The middle flower, *a*, terminates the stem; the two others, *b*-*b*, terminate short branches, one from the axil of each of the uppermost leaves; and being later than the middle one, the flowering proceeds from the centre outwards, or is *centrifugal*; — just the opposite of the indeterminate mode, or that where all the flower-buds are axillary. If flowering branches appear from the axils below, the lower ones are the later, so that the order of blossoming continues *centrifugal* or *descending* (which is the same thing), as in Fig. 166, making a sort of reversed raceme; — a kind of cluster which is to the true raceme just what the flat cyme is to the corymb.

217. Wherever there are bracts or leaves, buds may be produced from their axils and appear as flowers. Fig. 165 represents the case where the branches, *b b*, of Fig. 164, each with a pair of small

FIG. 163 *a*. Diagram of an opposite-leaved plant, with a single terminal flower. 164. Same, with a cyme of three flowers; *a*, the first flower, of the main axis; *b b*, those of branches. 165. Same, with flowers of the third order, *c c*. 166. Same, with flowers only of the second order from all the axils; the central or uppermost opening first, and so on downwards.

leaves or bracts about their middle, have branched again, and produced the branchlets and flowers *c c*, on each side. It is the continued repetition of this which forms the full or compound cyme, such as that of the Laurustinus, Hobblebush, Dogwood, and Hydrangea (Fig. 167).

218. **A Fascicle,** like that of the Sweet-William and Lychnis of the gardens, is only a cyme with the flowers much crowded, as it were, into a bundle.

219. **A Glomerule** is a cyme still more compacted, so as to form a sort of head. It may be known from a true head by the flowers not expanding centripetally, that is, not from the circumference towards the centre, or from the bottom to the top.

220. The illustrations of determinate or *cymose* inflorescence have been taken from plants with opposite leaves, which give rise to the most regular cymes. But the Rose, Cinquefoil, Buttercup, and the like, with alternate leaves, furnish equally good examples of this class of flower-clusters.

221. It may be useful to the student to exhibit the principal sorts of inflorescence in one view, in the manner of the following

Analysis of Flower-Clusters.

I. INDETERMINATE OR CENTRIPETAL. (198.)		
Simple; and with the		
Flowers borne on pedicels,		
Along the sides of a lengthened axis,	RACEME,	201.
Along a short axis; lower pedicels lengthened,	CORYMB,	203.
Clustered on an extremely short axis,	UMBEL,	205.
Flowers sessile, without pedicels (206),		
Along an elongated axis,	SPIKE,	207.
On a very short axis,	HEAD,	208.
with their varieties, the SPADIX, 209, and	CATKIN,	210.
Branching irregularly,	PANICLE,	213.
with its variety, the	THYRSUS,	214.
II. DETERMINATE OR CENTRIFUGAL. (215.)		
Open, mostly flat-topped or convex,	CYME,	216.
Contracted into a bundle,	FASCICLE,	218.
Contracted into a sort of head,	GLOMERULE,	219.

222. The numbers refer to the paragraphs of this Lesson. The various sorts run together by endless gradations in different plants. The botanist merely designates the leading kinds by particular names. Even the two classes of inflorescence are often found combined in the same plant. For instance, in the whole Mint Family,

the *flower-clusters* are *centrifugal*, that is, are *cymes* or *fascicles*; but they are themselves commonly disposed in spikes or racemes, which are centripetal, or develop in succession from below upwards.

167

LESSON XII.

THE FLOWER: ITS PARTS OR ORGANS.

223. HAVING considered, in the last Lesson, the arrangement of flowers on the stem or the places from which they arise, we now direct our attention to the flower itself.

224. **Nature and Use of the Flower.** The object of the flower is the *production of seed*. The flower consists of all those parts, or *organs*, which are subservient to this end. Some of these parts are necessary to the production of seed. Others serve merely to protect or support the more essential parts.

FIG. 167. Cyme of the Wild Hydrangea (with neutral flowers in the border).

225. **The Organs of the Flower** are therefore of two kinds; namely, first, the *protecting organs*, or *leaves of the flower*, — also called the *floral envelopes*, — and, second, the *essential organs*. The latter are situated within or a little above the former, and are enclosed by them in the bud.

226. **The Floral Envelopes** in a complete flower are double; that is, they consist of two whorls (181), or circles of leaves, one above or within the other. The outer set forms the *Calyx;* this more commonly consists of green or greenish leaves, but not always. The inner set, usually of a delicate texture, and of some other color than green, and in most cases forming the most showy part of the blossom, is the *Corolla*.

227. The floral envelopes, taken together, are sometimes called the *Perianth*. This name is not much used, however, except in cases where they form only one set, at least in appearance, as in the Lily, or where, for some other reason, the limits between the calyx and the corolla are not easily made out.

228. Each leaf or separate piece of the corolla is called a *Petal;* each leaf of the calyx is called a *Sepal*. The sepals and the petals — or, in other words, the leaves of the blossom — serve to protect, support, or nourish the parts within. They do not themselves make a perfect flower.

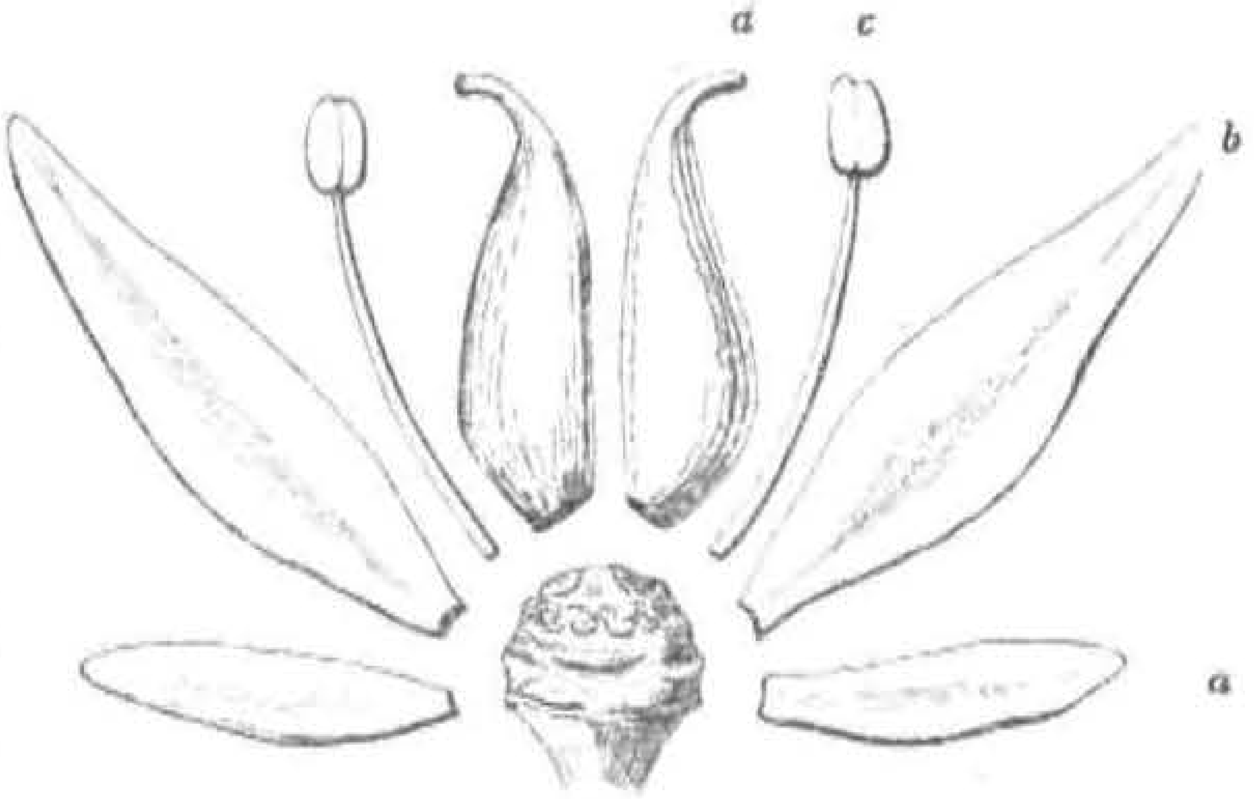
229. Some plants, however, naturally produce, besides their perfect flowers, others which consist only of calyx and corolla (one or both), that is, of leaves. These, destitute as they are of the essential organs, and incapable of producing seed, are called *neutral* flowers. We have an example in the flowers round the margin of the cyme of the Hydrangea (Fig. 167), and of the Cranberry-Tree, or Snowball, in their wild state. By long cultivation in gardens the whole cluster has been changed into showy, but useless, neutral flowers, in these and some other cases. What are called *double flowers*, such as full Roses (Fig. 173), Buttercups, and Camellias, are blossoms which, under the gardener's care, have developed with all their essential organs changed into petals. But such flowers are always in an unnatural or monstrous condition, and are incapable of maturing seed, for want of

230. **The Essential Organs.** These are likewise of two kinds, placed one above or within the other; namely, first, the *Stamens* or fertilizing organs, and, second, the *Pistils*, which are to be fertilized and bear the seeds.

231. Taking them in succession, therefore, beginning from below, or at the outside, we have (Fig. 168, 169), first, the *calyx* or outer circle of leaves, which are individually termed *sepals* (*a*); secondly, the *corolla* or inner circle of delicate leaves, called *petals* (*b*); then a set of *stamens* (*c*); and in the centre one or more pistils (*d*). The end of the flower-stalk, or the short axis, upon which all these parts stand, is called the *Torus* or *Receptacle*.

168

232. We use here for illustration the flower of a species of Stonecrop (Sedum ternatum), — which is a common plant wild in the Middle States, and in gardens almost everywhere, — because, although small, it exhibits all the parts in a perfectly simple and separate state, and so answers for a sort of pattern flower, better than any larger one that is common and well known.



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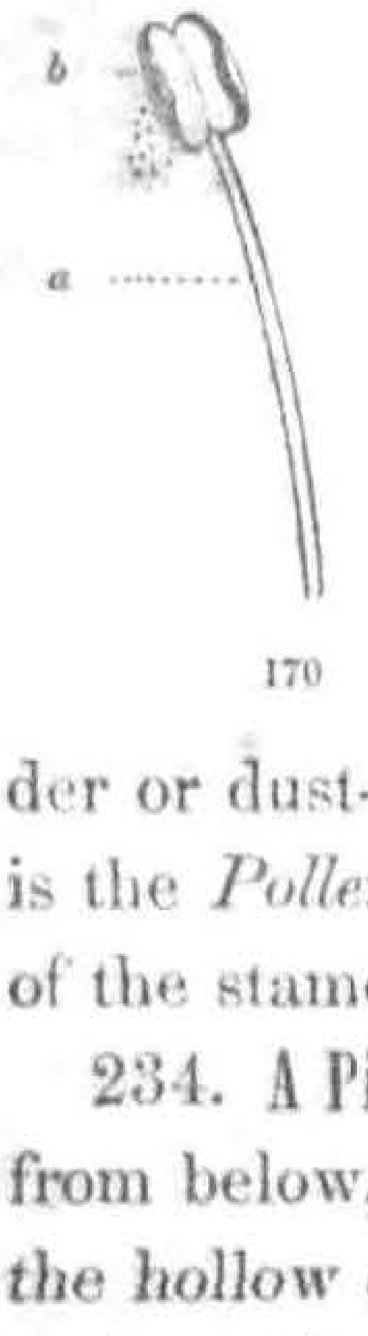
233. **A Stamen** consists of two parts, namely, the *Filament* or stalk (Fig. 170, *a*), and the *Anther* (*b*). The latter is the only essential part. It is a case, commonly with two lobes or cells, each opening lengthwise by a slit, at the proper time, and discharging a powder or dust-like substance, usually of a yellow color. This powder is the *Pollen*, or fertilizing matter, to produce which is the sole office of the stamen.



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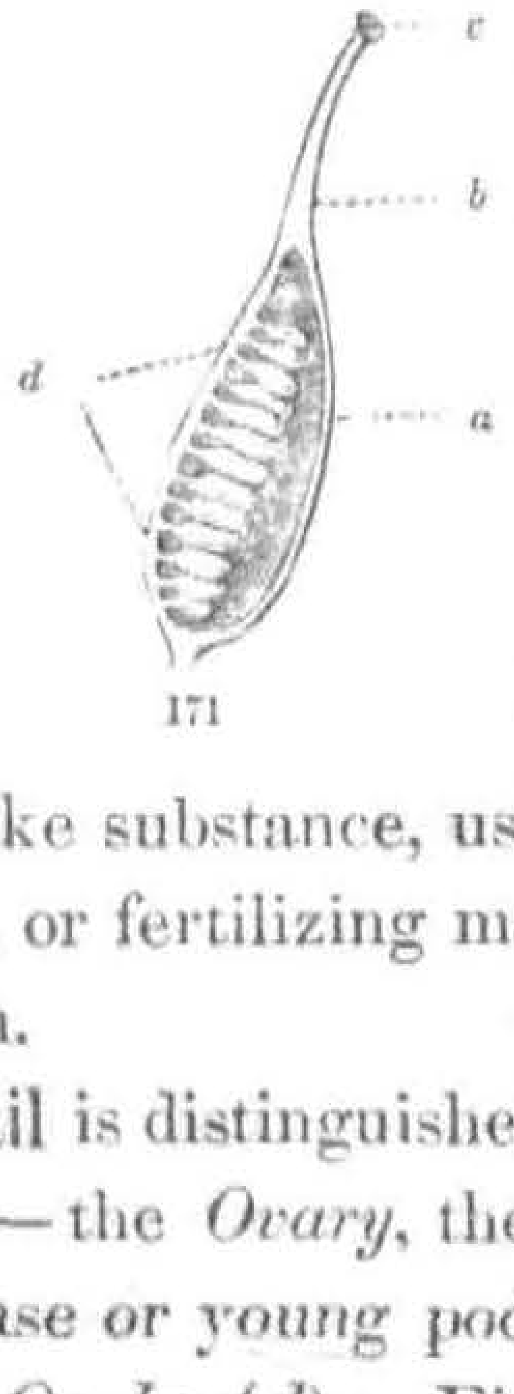

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234. **A Pistil** is distinguished into three parts; namely, — beginning from below, — the *Ovary*, the *Style*, and the *Stigma*. The *Ovary* is the hollow case or young pod (Fig. 171, *a*), containing rudimentary seeds, called *Ovules* (*d*). Fig. 172, representing a pistil like that of

FIG. 168. Flower of a Stonecrop: Sedum ternatum.

FIG. 169. Two parts of each kind of the same flower, displayed and enlarged.

FIG. 170. A stamen: *a*, the filament; *b*, the anther, discharging pollen.

FIG. 171. A pistil divided lengthwise, showing the interior of the ovary, *a*, and its ovules, *d*; *b*, the style; *c*, stigma.

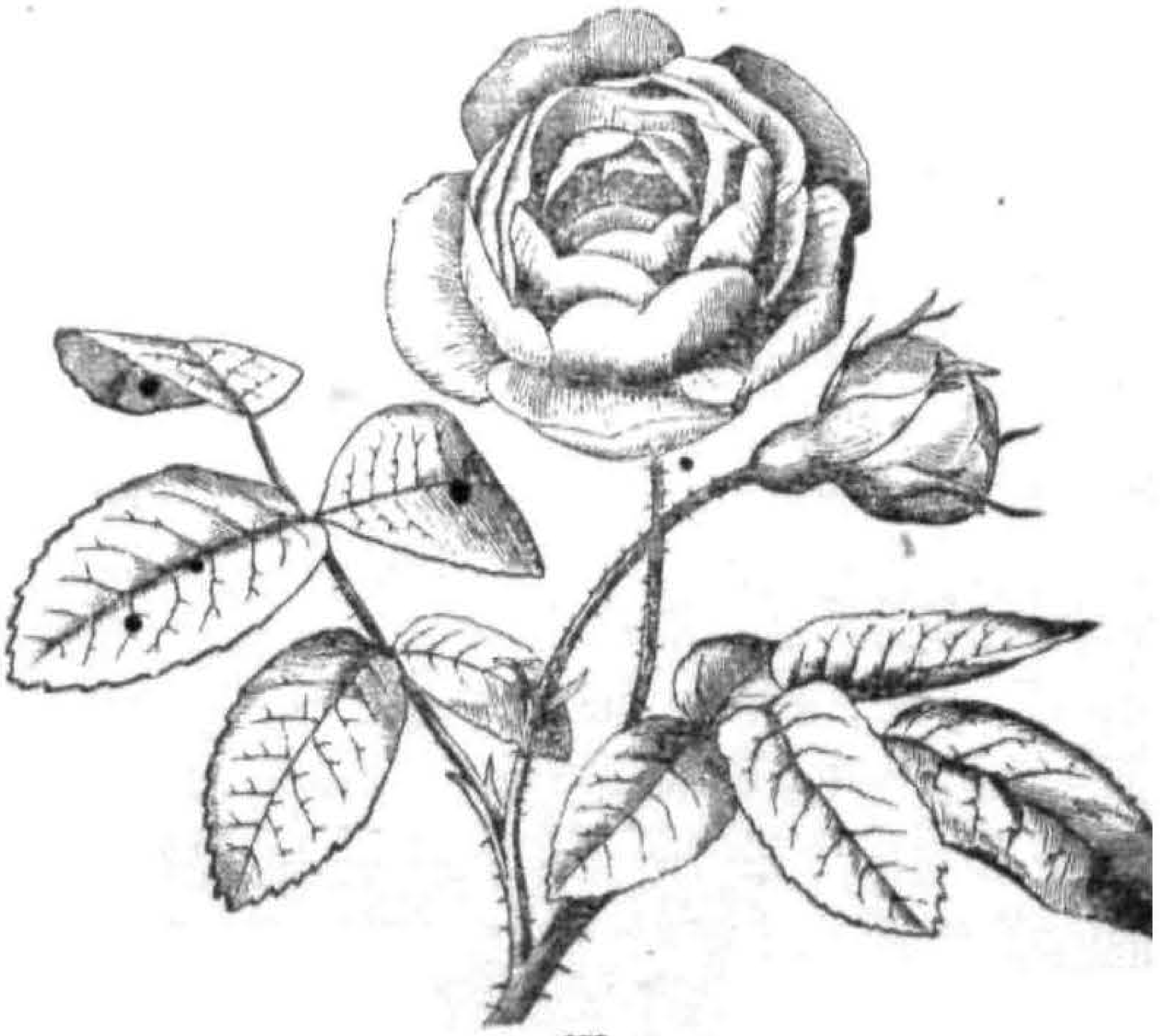
FIG. 172. A pistil, enlarged; the ovary cut across to show the ovules within.

FIG. 173. "Double" Rose; the essential organs all replaced by petals.

Fig. 169, *d*, but on a larger scale, and with the ovary cut across, shows the ovules as they appear in a transverse section. The *style* (Fig. 171, *b*) is the tapering part above, sometimes long and slender, sometimes short, and not rarely altogether wanting, for it is not an essential part like the two others. The *stigma* (*c*) is the tip or some other portion of the style (or of the top of the ovary when there is no distinct style), consisting of loose tissue, not covered, like the rest of the plant, by a skin or epidermis. It is upon the stigma that the pollen falls; and the result is, that the ovules contained in the ovary are fertilized and become *seeds*, by having an embryo (16) formed in them. To the pistil, therefore, all the other organs of the blossom are in some way or other subservient: the stamens furnish pollen to fertilize its ovules; the corolla and the calyx form coverings which protect the whole.

172

234ⁿ. These are all the parts which belong to any flower. But these parts appear under a variety of forms and combinations, some of them greatly disguising their natural appearance. To understand the flower, therefore, under whatever guise it may assume, we must study its plan.



173

LESSON XIII.

THE PLAN OF THE FLOWER.

235. THE FLOWER, like every other part of the plant, is formed upon *a plan*, which is essentially the same in all blossoms; and the student should early get a clear idea of the plan of the flower. Then the almost endless varieties which different blossoms present will be at once understood whenever they occur, and will be regarded with a higher interest than their most beautiful forms and richest colors are able to inspire.

236. We have already become familiar with the plan of the vegetation; — with the stem, consisting of joint raised upon joint, each bearing a leaf or a pair of leaves; with the leaves arranged in symmetrical order, every leaf governed by a simple arithmetical law, which fixes beforehand the precise place it is to occupy on the stem; and we have lately learned (in Lesson 11) how the position of each blossom is determined beforehand by that of the leaves; so that the shape of every flower-cluster in a bouquet is given by the same simple mathematical law which arranges the foliage. Let us now contemplate the flower in a similar way. Having just learned what parts it consists of, let us consider the plan upon which it is made, and endeavor to trace this plan through some of the various forms which blossoms exhibit to our view.

237. In order to give at the outset a correct idea of the blossom, we took, in the last Lesson, for the purpose of explaining its parts, a *perfect, complete, regular*, and *symmetrical* flower, and one nearly as *simple* as such a flower could well be. Such a blossom the botanist regards as

238. **A Typical Flower,** that is, a *pattern flower*, because it well exemplifies the plan upon which all flowers are made, and serves as what is called a *type*, or standard of comparison.

239. Another equally good typical flower (except in a single respect, which will hereafter be mentioned), and one readily to be obtained in the summer, is that of the Flax (Fig. 174). The parts differ in shape from those of the Stonecrop; but the whole plan is evidently just the same in both. Only, while the Stonecrop has ten stamens, or in many flowers eight stamens, — in all cases just twice

as many as there are petals,—the Flax has only five stamens, or just as many as the petals. Such flowers as these are said to be

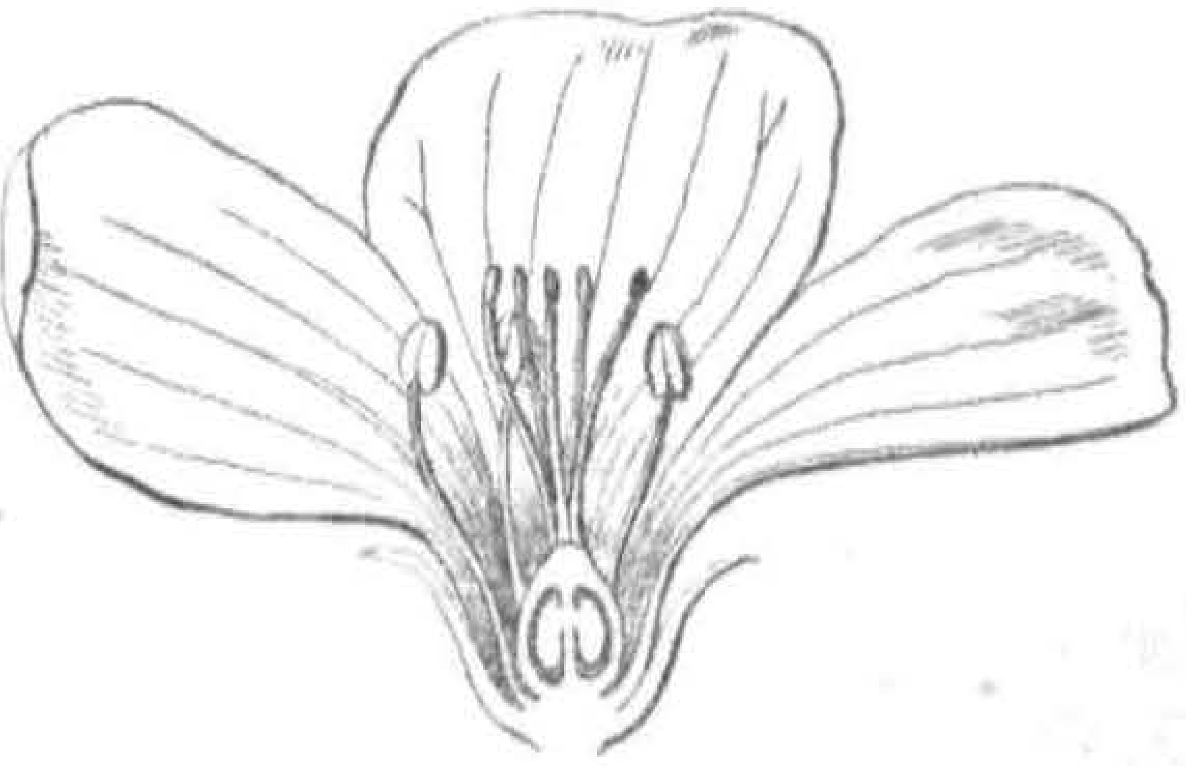
Perfect, because they are provided with both kinds of essential organs (230), namely, stamens and pistils;

174

Complete, because they have all the *sorts* of organs which any flower has, namely, both calyx and corolla, as well as stamens and pistils;

Regular, because all the parts of each set are alike in shape and size; and

Symmetrical, because they have an equal number of parts of each sort, or in each set or circle of organs. That is, there are five sepals, five petals, five stamens, or in the Stonecrop *ten* stamens (namely, two sets of five each), and five pistils.



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240. On the other hand, many flowers do not present this perfect symmetry and regularity, or this completeness of parts. Accordingly, we may have

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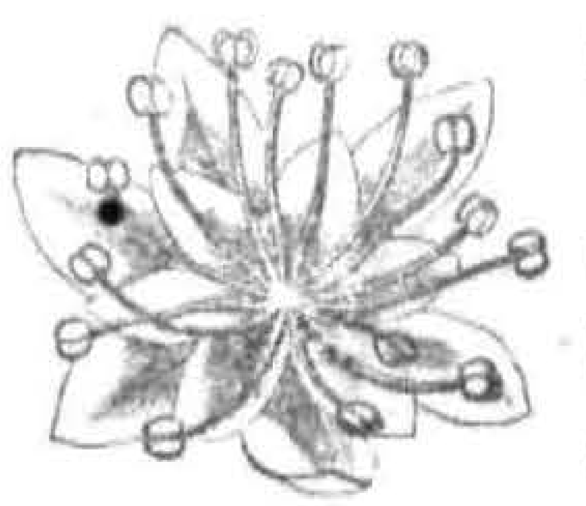
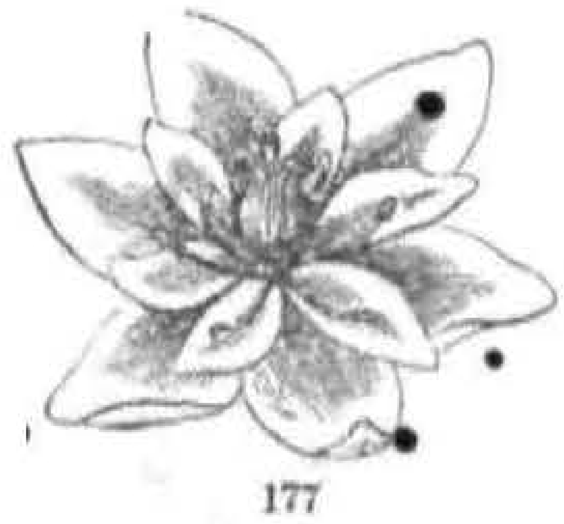




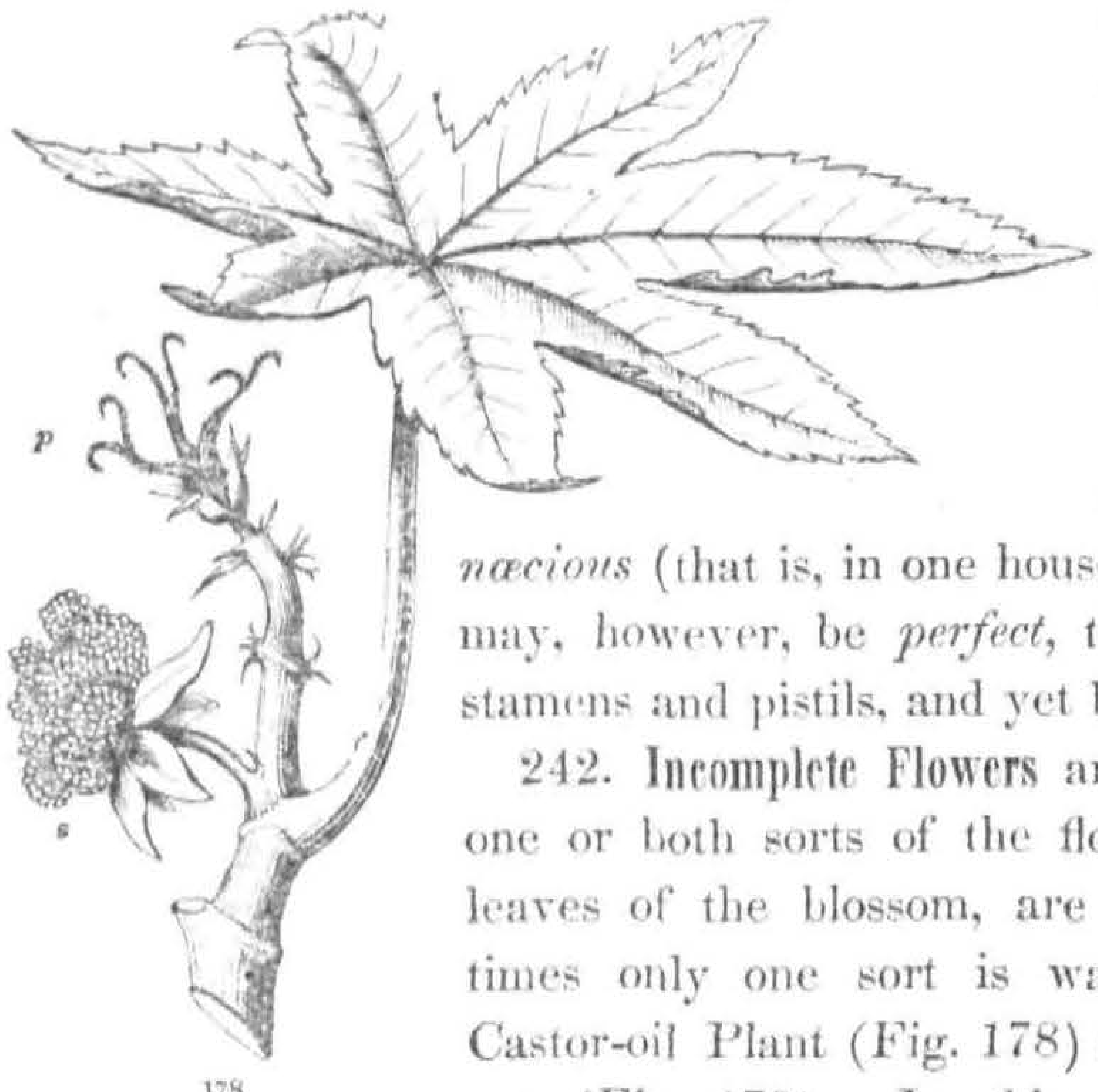
177

241. **Imperfect, or Separated Flowers**; which are those where the stamens and pistils are in separate blossoms; that is, one sort of flowers has stamens and no pistils, and another has pistils and no stamens, or only imperfect ones. The blossom which has stamens but no pistils is called a *staminate* or *sterile* flower (Fig. 176); and the corresponding one with pistils but no stamens is called a *pistillate* or *fertile* flower (Fig. 177). The two sorts may grow on distinct plants, from different roots, as they do in the Willow and Poplar, the Hemp, and the Moonseed

FIG. 174. Flowers of the common Flax: a perfect, complete, regular, and symmetrical blossom, all its parts in fives. 175. Half of a Flax-flower divided lengthwise, and enlarged.

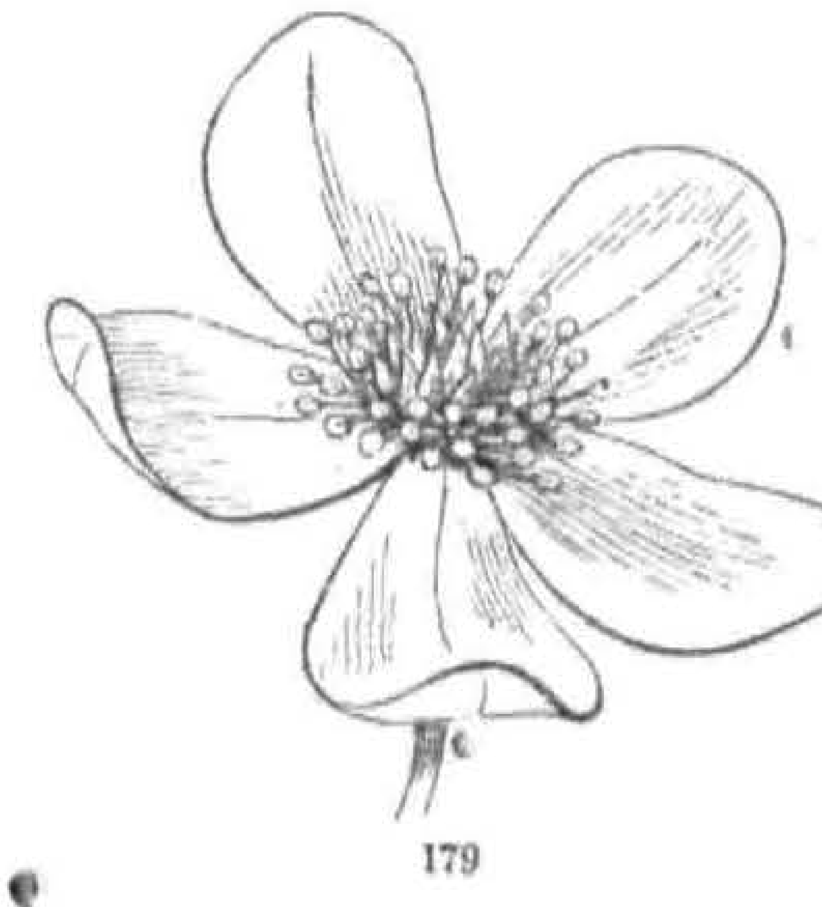
FIG. 176. Staminate flower of Moonseed (Menispermum Canadense). 177. Pistillate flower of the same.

(Fig. 176, 177); when the flowers are said to be *diœcious* (from two Greek words meaning in two households). Or the two may occur on the same plant or the same stem, as in the Oak, *Walnut*, *Nettle*, and the Castor-oil Plant (Fig. 178); when the flowers are said to be *monœcious* (that is, in one household). A flower may, however, be *perfect*, that is, have both stamens and pistils, and yet be *incomplete*.



178

242. **Incomplete Flowers** are those in which one or both sorts of the floral envelopes, or leaves of the blossom, are wanting. Sometimes only one sort is wanting, as in the Castor-oil Plant (Fig. 178) and in the Anemone (Fig. 179). In this case the missing sort is always supposed to be the inner, that is, the corolla; and accordingly such flowers are said to be *apetalous* (meaning without petals). Occasionally both the corolla and the calyx are wanting, when the flower has no proper coverings or floral envelopes at all. It is then said to be *naked*, as in the Lizard's-tail (Fig. 180), and in the Willow.



179

243. Our two pattern flowers (Fig. 168, 174) are regular and symmetrical (239). We commonly expect this to be the case in living things. The corresponding parts of plants, like the limbs or members of animals, are generally alike, and the whole arrangement is symmetrical. This symmetry pervades the blossom, especially. But the student may often fail to perceive

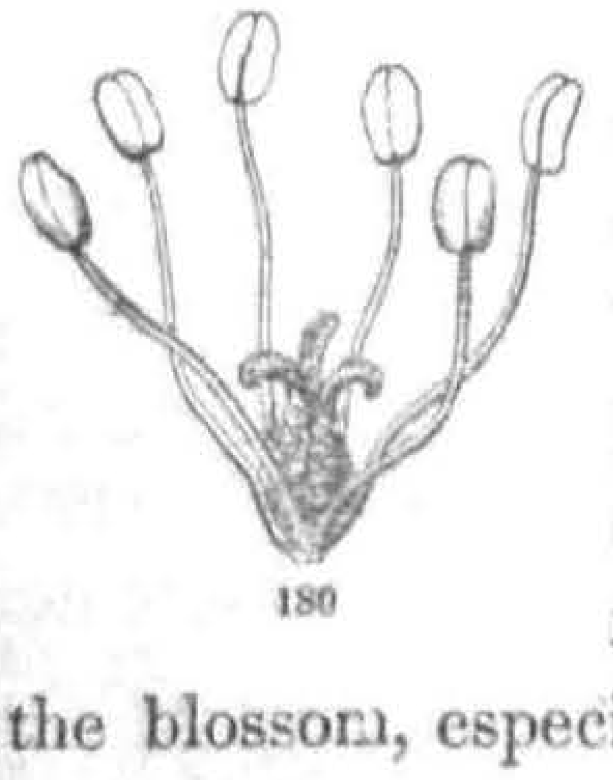


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FIG. 178. Monœcious flowers, i. e. one staminate (*s*) and one pistillate (*p*) flower, of the Castor-oil Plant, growing on the same stem.

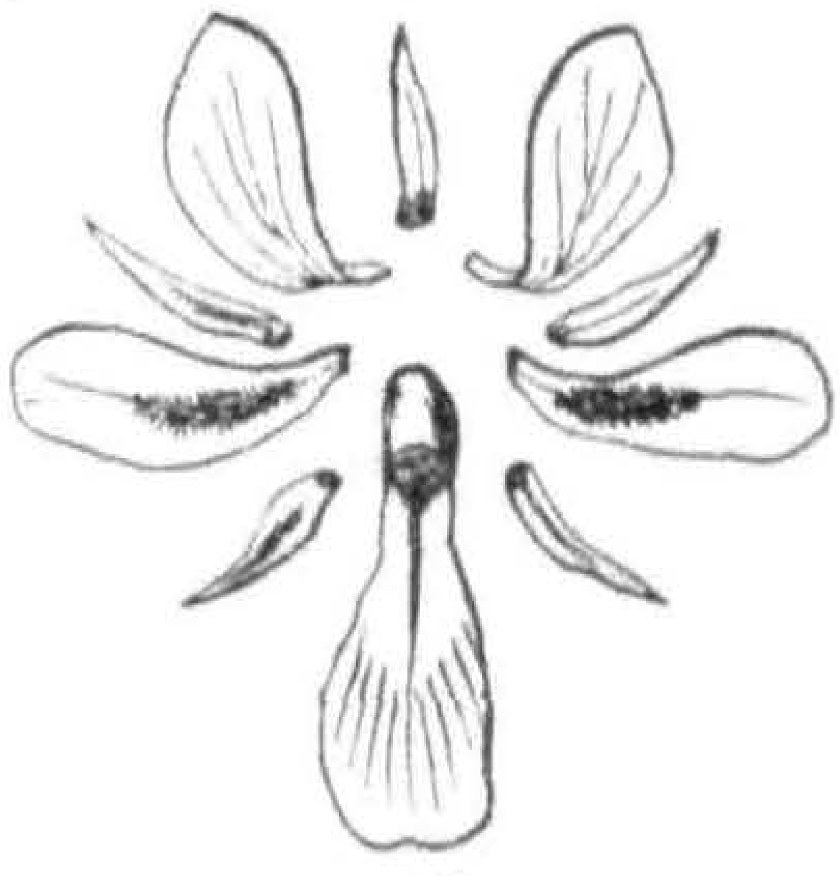
FIG. 179. Apetalous (incomplete) flower of Anemone Pennsylvanica.

FIG. 180. A naked (but perfect) flower of the Lizard's-tail.

it, at first view, at least in cases where the plan is more or less obscured by the leaving out (*obliteration*) of one or more of the members of the same set, or by some inequality in their size and shape. The latter circumstance gives rise to

181

244. **Irregular Flowers.** This name is given to blossoms in which the different members of the same sort, as, for example, the petals or the stamens, are unlike in size or in form. We have familiar cases of the sort in the Larkspur (Fig. 183, 184), and Monkshood (Fig. 185, 186); also in the Violet (Fig. 181, 182). In the latter it is the corolla principally which is irregular, one of the petals being larger than the rest, and extended at the base into a hollow protuberance or spur. In the Larkspur (Fig. 183), both the calyx and the corolla partake of the irregularity. This and the Monkshood are likewise good examples of



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184

245. **Unsymmetrical Flowers.** We call them unsymmetrical, when the different sets of organs do not agree in the number of their parts. The irregular calyx of Larkspur (Fig. 183, 184) consists of five sepals, one of which, larger than the rest, is prolonged behind into a large spur; but the corolla is made of only four petals (of two shapes);

FIG. 181. Flower of a Violet. 182. Its calyx and corolla displayed: the five smaller parts are the sepals; the five intervening larger ones are the petals.

FIG. 183. Flower of a Larkspur. 184. Its calyx and corolla displayed; the five larger pieces are the sepals; the four smaller, the petals.

the fifth, needed to complete the symmetry, being left out. And the Monkshood (Fig. 185, 186) has five very dissimilar sepals,

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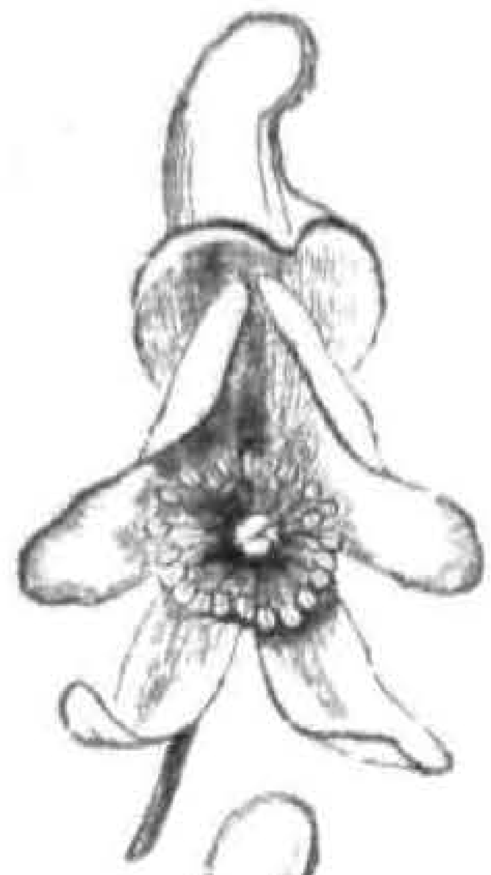

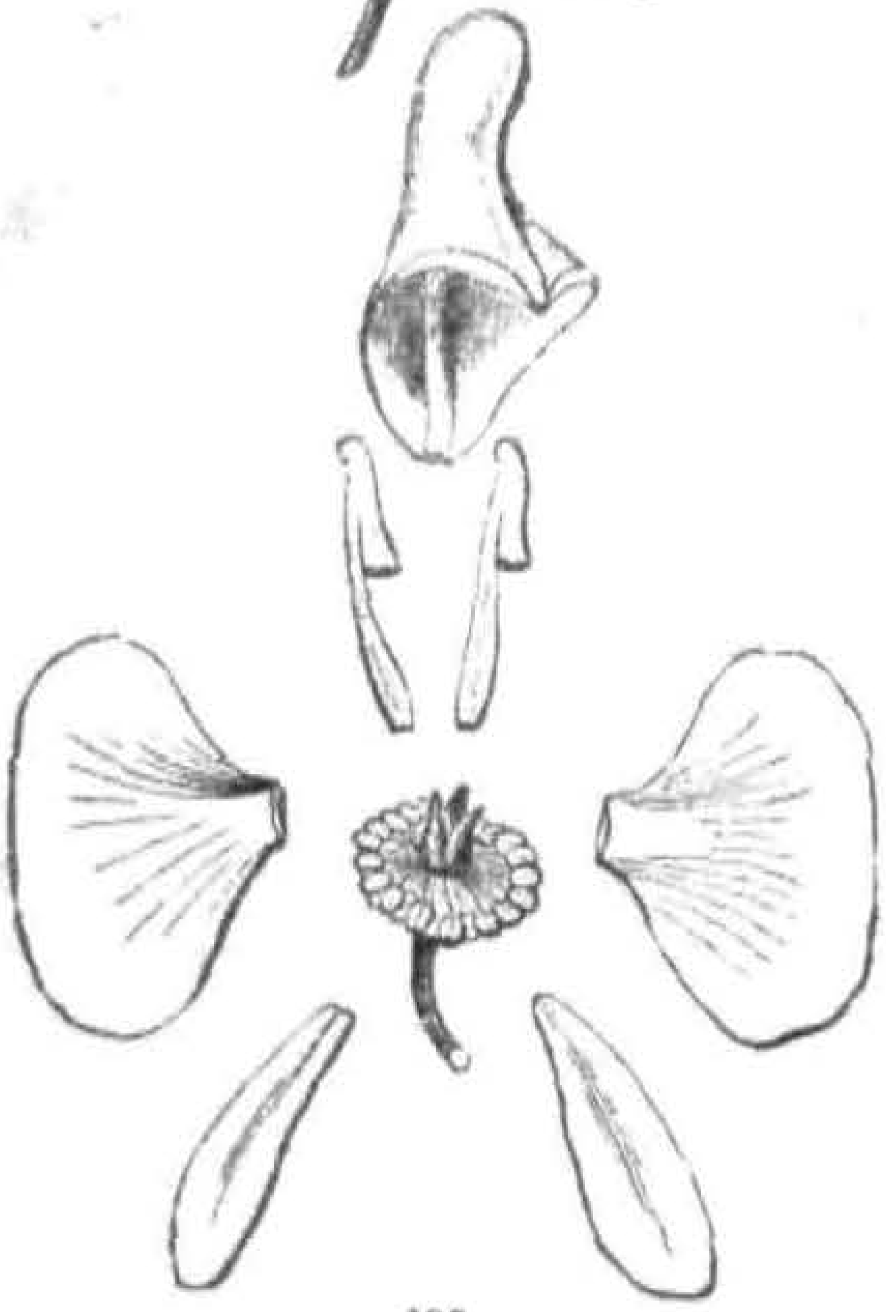

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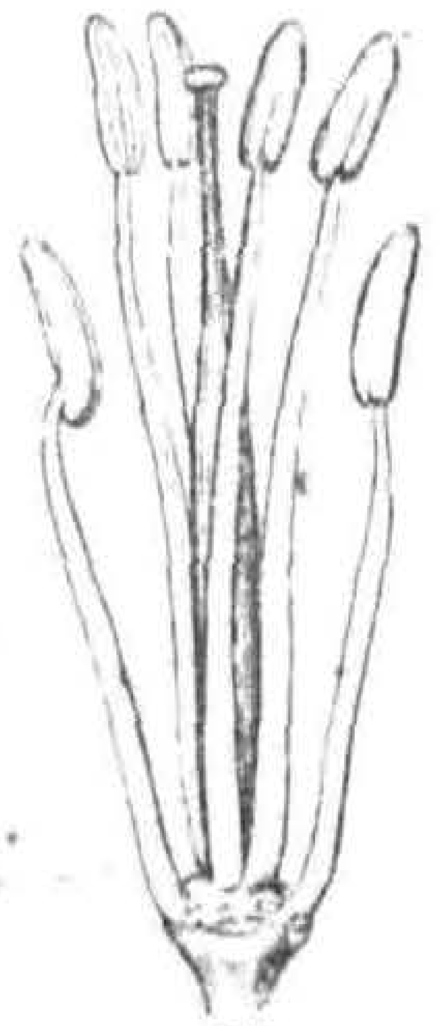
and a corolla of *only two*, very small, curiously-shaped petals; the three needed to make up the symmetry being left out. For a flower which is unsymmetrical but regular, we may take the common Purslane, which has a calyx of only two sepals, but a corolla of five petals, from seven to twelve stamens, and about six styles. The Mustard, and all flowers of that family, are unsymmetrical as to the stamens, these being six in number (Fig. 188, while the leaves of the blossom (sepals and petals) are each only four (Fig. 187). Here the stamens are *irregular* also, two of them being shorter than the other four.

187



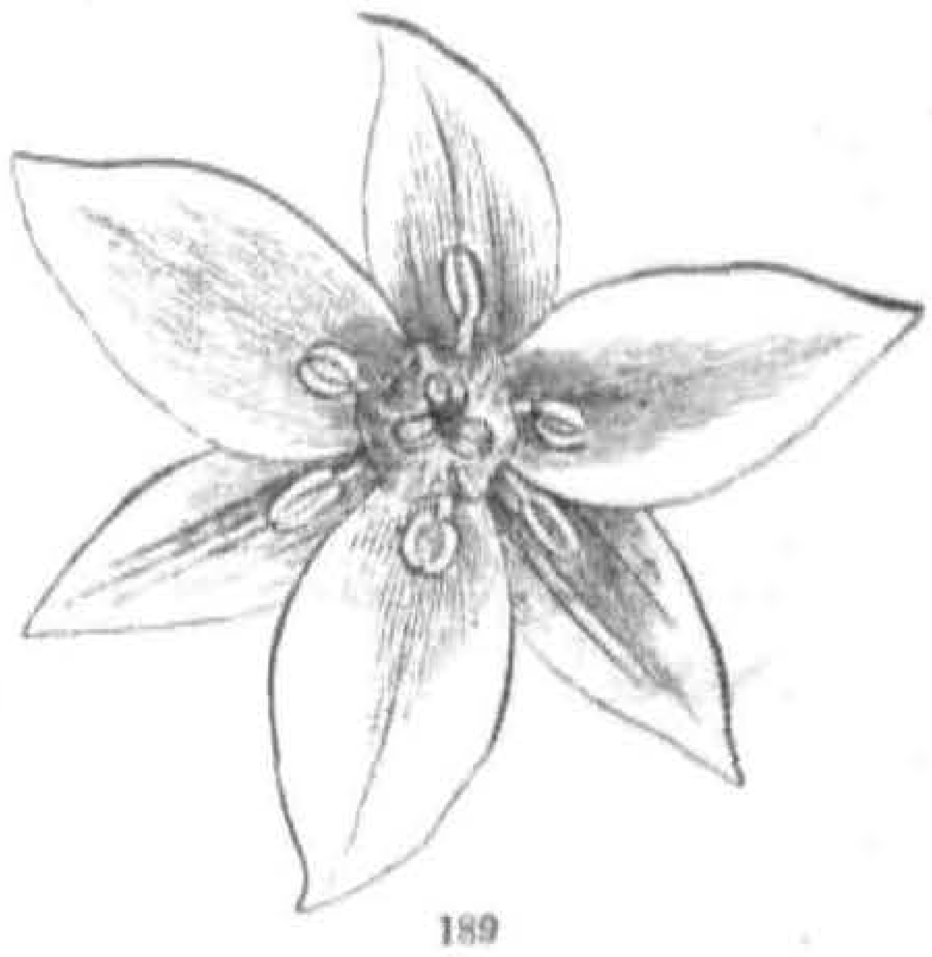
188

246. **Numerical Plan of the Flower.** Although not easy to make out in all cases, yet generally it is plain to see that each blossom is based upon a particular number, which runs through all or most of its parts. And a principal thing which a botanist notices when examining a flower is its numerical plan. It is upon this that the symmetry of the blossom depends. Our two pattern flowers, the Stonecrop (Fig. 168) and the Flax (Fig. 174), are based upon the number five, which is exhibited in all their parts. Some flowers of this same Stonecrop have their parts in fours, and then that number runs throughout; namely, there are four sepals, four petals, eight stamens (two sets), and four pistils. The Mustard (Fig. 187, 188), Radish,

FIG. 185. Flower of a Monkshood. 186. Its parts displayed: the five larger pieces are the sepals; the two small ones under the hood are petals; the stamens and pistils are in the centre.

FIG. 187. Flower of Mustard. 188. Its stamens and pistil separate and enlarged.

&c., also have their flowers constructed on the plan of four as to the calyx and corolla, but this number is interfered with in the stamens, either by the leaving out of two stamens (which would complete two sets), or in some other way. Next to five, the most common number in flowers is three. On this number the flowers of Lily, Crocus, Iris, Spiderwort, and Trillium (Fig. 189) are constructed. In the Lily and Crocus the leaves of the flower at first view appear to be six in one set; but the bud or just-opening blossom plainly shows these to consist of an outer and an inner circle, each of three parts, namely, of calyx and corolla, both of the same bright color and delicate texture. In the Spiderwort and Trillium (Fig. 189) the three outer leaves, or sepals, are green, and different in texture from the three inner, or the petals; the stamens are six (namely, two sets of three each), and the pistils three, though partly grown together into one mass.



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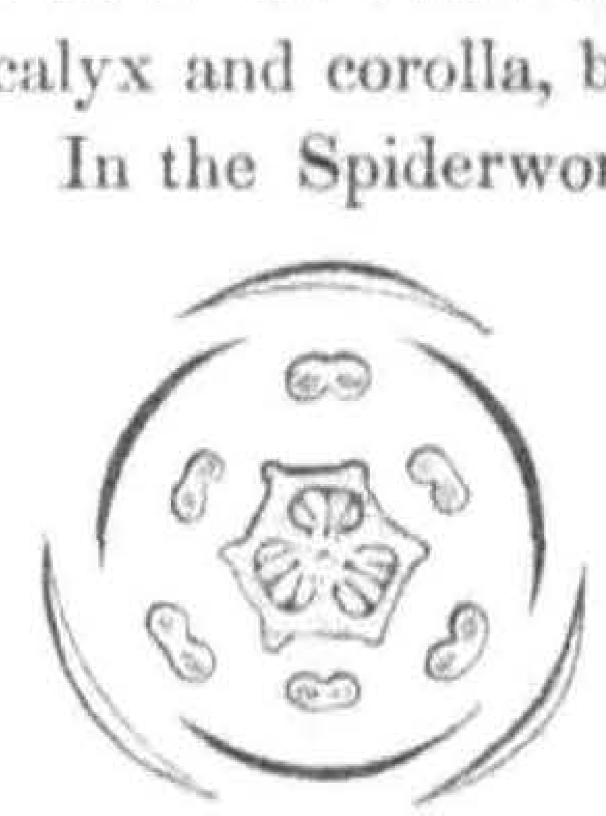

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247. **Alternation of Parts.** The symmetry of the flower is likewise shown in the arrangement or relative position of successive parts. The rule is, that the parts of successive circles *alternate* with one another. That is, the petals stand over the intervals between the sepals; the stamens, when of the same number, stand over the intervals between the petals; or when twice as many, as in the Trillium, the outer set alternates with the petals, and the inner set, alternating with the other, of course stands before the petals; and the pistils alternate with these. This is shown in Fig. 189, and in the diagram, or cross-section of the same in the bud, Fig. 190. And Fig. 191 is a similar diagram or ground-plan (in the form of a

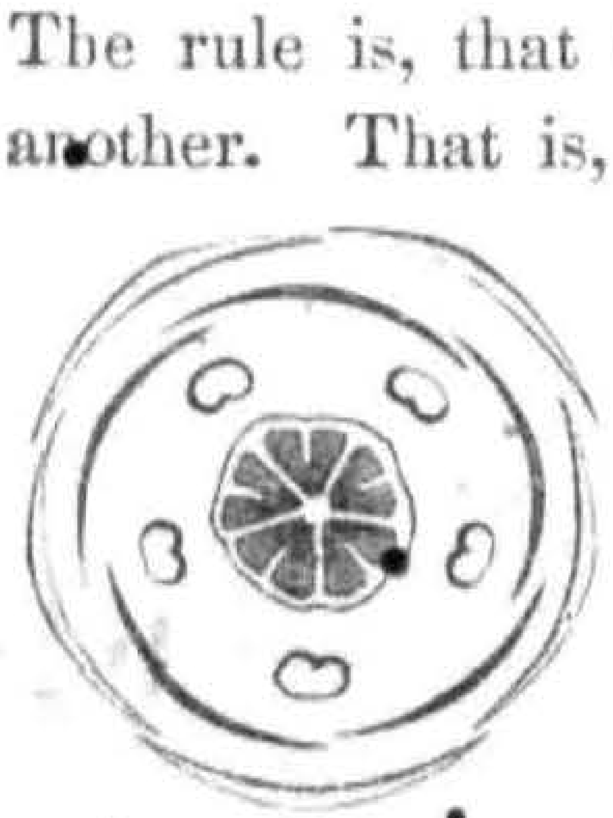

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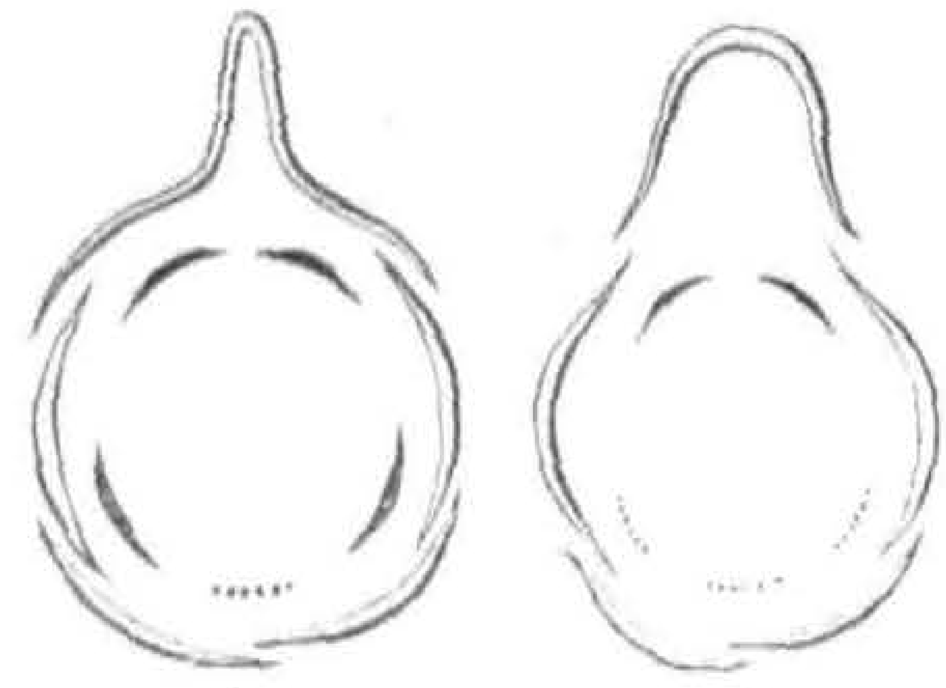
FIG. 189. Flower of Trillium erectum, or Birthroot, spread out a little, and viewed from above

FIG. 190. Diagram or ground-plan of the same, as it would appear in a cross-section of the bud; — the parts all in the same relative position

FIG. 191. Diagram, or ground-plan, of the Flax-flower, Fig. 174.

section made across the bud) of the Flax blossom, the example of a pattern symmetrical flower taken at the beginning of this Lesson, with its parts all in fives.

248. Knowing in this way just the position which each organ should occupy in the flower, it is readily understood that flowers often become unsymmetrical through the loss of some parts, which belong to the plan, but are obliterated *or left out in the execution.* For example, in the Larkspur (Fig. 183, 184), as there are five sepals, there should be five petals likewise. We find only four; but the vacant place where the fifth belongs is plainly recognized at the lower side of the flower. Also the similar plan of the Monkshood (Fig. 186) equally calls for five petals; *but three of them are entirely obliterated, and the two* that remain are reduced to slender bodies, which look as unlike ordinary petals as can well be imagined. Yet their position, answering to the intervals between the upper sepals and the side ones, reveals their true nature. All this may perhaps be more plainly shown by corresponding diagrams of the calyx and corolla of the Larkspur and Monkshood (Fig. 192, 193), in which the places of the missing petals are indicated by faint dotted lines. The obliteration of stamens is a still more common case. For example, the Snapdragon, Foxglove, Gerardia, and almost all flowers of the large Figwort family they belong to, have the parts of the calyx and corolla five each, but only four stamens (Fig. 194); the place on the upper side of the flower where the fifth stamen belongs is vacant. That there is in such cases a real obliteration of the missing part is shown by the



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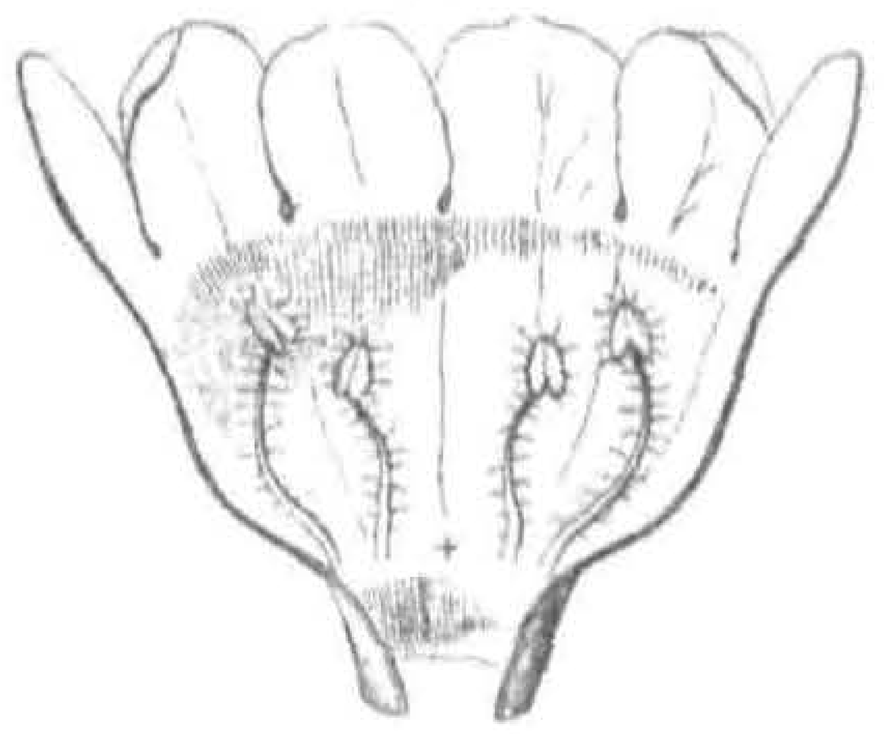
249. **Abortive Organs**, or vestiges which are sometimes met with; — bodies which stand in the place of an organ, and represent it, although wholly incapable of fulfilling its office. Thus, in the Figwort family, the fifth stamen, which is altogether missing in Gerardia (Fig. 194) and most others, appears in the Figwort as a little scale, and in Pentstemon (Fig. 195) and Turtlehead as a sort of filament without any anther; — a thing of no use whatever to the plant, but

FIG. 192. Diagram of the calyx and corolla of a Larkspur. 193. Similar diagram of Monkshood. The dotted lines show where the petals are wanting; one in the former, three

very interesting to the botanist, since it completes the symmetry of the blossom. And to show that this really is the lost stamen, it now and then bears an anther, or the rudiment of one. So the flower of Catalpa should likewise have five stamens; but we seldom find more than two good ones. Still we may generally discern the three others, as vestiges or half-obliterated stamens (Fig. 196). In separated flowers the rudiments of pistils are often found in the sterile blossom, and rudimentary stamens in the fertile blossom, as in Moonseed (Fig. 177).

194



250. **Multiplication of Parts.** Quite in the opposite way, the simple plan of the flower is often more or less obscured by an increase in the number of parts. In the White Water-Lily, and in many Cactus-flowers (Fig. 197), all the parts are very numerous, so that it is hard to say upon what number the blossom is constructed. But more commonly some of the sets are few and definite in the number of their parts. The Buttercup, for instance, has five sepals and five petals, but many stamens and pistils; so it is built upon the plan of five. The flowers of Magnolia have indefinitely numerous stamens and pistils, and rather numerous floral envelopes; but these latter are plainly distinguishable into sets of three; namely, there are three sepals, and six petals in two circles, or nine in three circles,—showing that these blossoms are constructed on the number three.

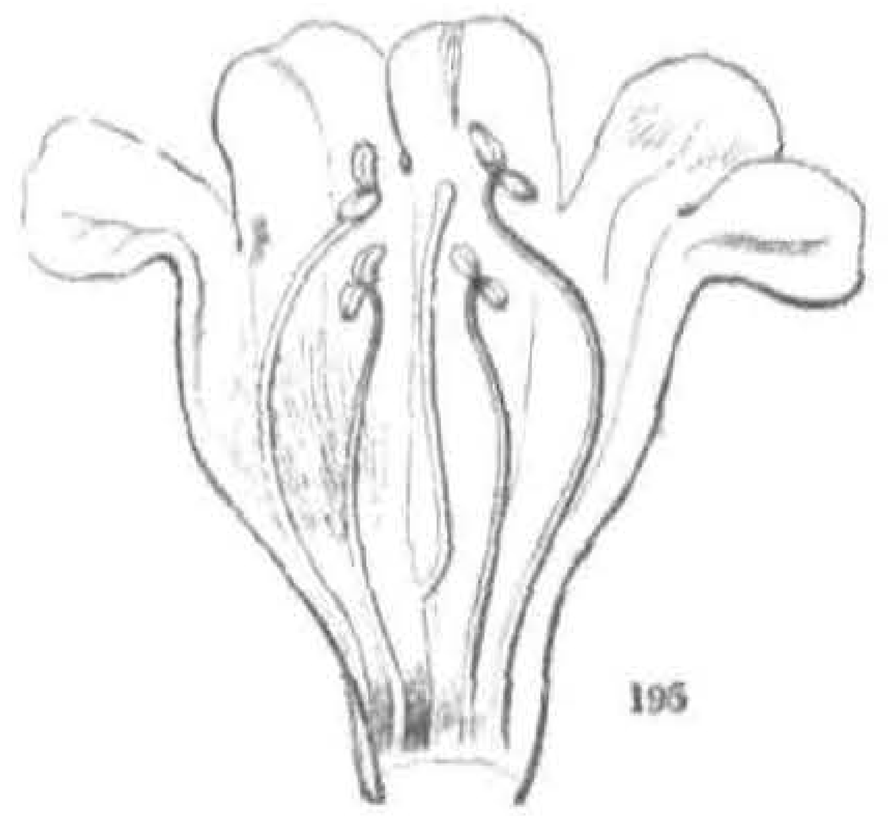


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FIG. 194. Corolla of a purple Gerardia laid open, showing the four stamens; the cross shows where the fifth stamen would be, if present.

FIG. 195. Corolla, laid open, and stamens of Pentstemon grandiflorus of Iowa, &c., with a sterile filament in the place of the fifth stamen, and representing it.

FIG. 196. Corolla of Catalpa laid open, displaying two good stamens and three abortive vestiges of stamens.

LESSON XIV.

MORPHOLOGY OF THE FLOWER.

251. In all the plant till we came to the blossom we found nothing but root, stem, and leaves (23, 118). However various or strange their shapes, and whatever their use, everything belongs to one of these three organs, and everything above ground (excepting the rare case of aerial roots) is either stem or leaf. We discern the stem equally in the stalk of an herb, the trunk and branches of a tree, the trailing or twining Vine, the straw of Wheat or other Grasses, the columnar trunk of Palms (Fig. 47), in the flattened joints of the Prickly-Pear Cactus, and the rounded body of the Melon Cactus (Fig. 76). Also in the slender runners of the Strawberry, the tendrils of the Grape-vine and Virginia Creeper, the creeping subterranean shoots of the Mint and Couchgrass, the tubers of the Potato and Artichoke, the solid bulb of the Crocus, and the solid part or base of scaly bulbs; as is fully shown in Lesson 6. And in Lesson 7 and elsewhere we have learned to recognize the leaf alike in the thick seed-leaves of the Almond, Bean, Horsechestnut, and the like (Fig. 9 – 24), in the scales of buds (Fig. 77), and the thickened

scales of bulbs (Fig. 73 – 75), in the spines of the Barberry and the tendrils of the Pea, in the fleshy rosettes of the Houseleek, the strange fly-trap of Dionæa (Fig. 81), and the curious pitcher of Sarracenia (Fig. 79).

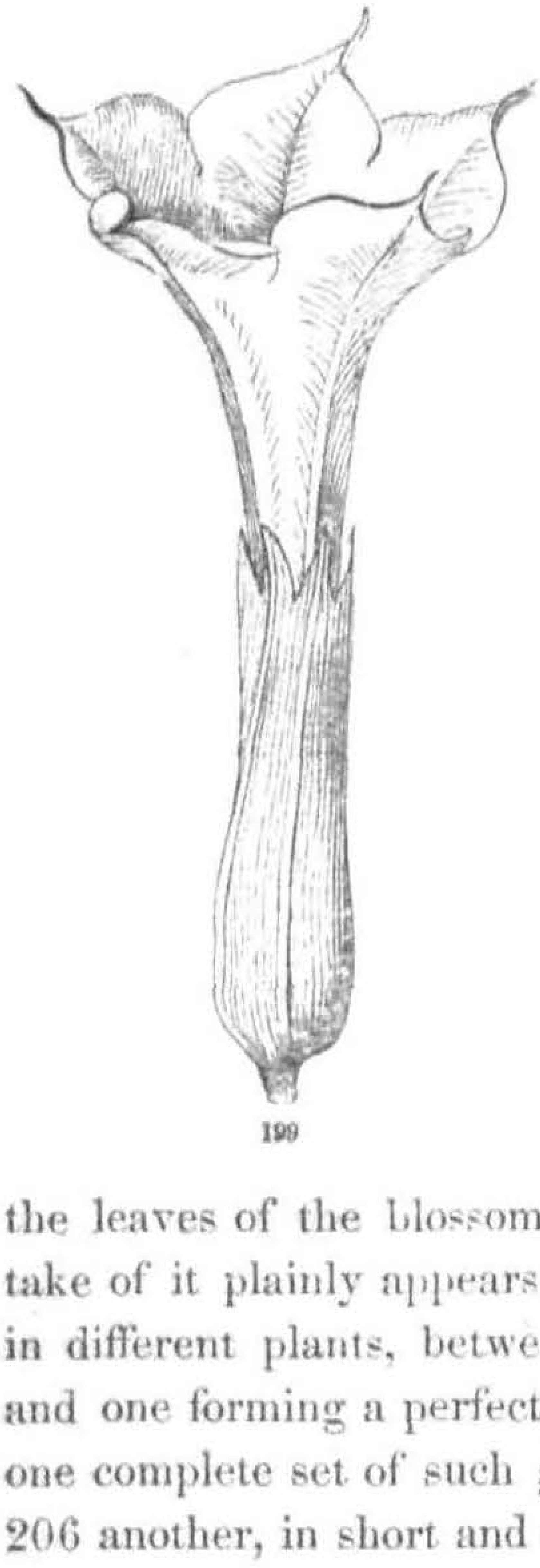
252. Now the student who understands these varied forms or *metamorphoses* of the stem and leaf, and knows how to detect the real nature of any part of the plant under any of its disguises, may readily trace the leaf into the blossom also, and perceive that, as to their morphology,

253. **Flowers are altered Branches**, and their parts, therefore, altered leaves. That is, certain buds, which might have grown and lengthened into a leafy branch, do, under other circumstances and to accomplish other purposes, develop into blossoms. In these the axis remains short, nearly as it is in the bud; the leaves therefore remain close together in sets or circles; the outer ones, those of the calyx, generally partake more or less of the character of foliage; the next set are more delicate, and form the corolla, while the rest, the stamens and pistils, appear under forms very different from those of ordinary leaves, and are concerned in the production of seed. This is the way the scientific botanist views a flower; and this view gives to Botany an interest which one who merely notices the shape and counts the parts of blossoms, without understanding their plan, has no conception of.

254. That flowers answer to branches may be shown first from their position. As explained in the Lesson on Inflorescence, flowers arise from the same places as branches, and from no other; flower-buds, like leaf-buds, appear either on the summit of a stem, that is, as a terminal bud, or in the axil of a leaf, as an axillary bud (196). And at an early stage it is often impossible to foretell whether the bud is to give rise to a blossom or to a branch.

255. That the sepals and petals are of the nature of leaves is evident from their appearance; persons who are not botanists commonly call them the leaves of the flower. The calyx is most generally green in color, and foliaceous (leaf-like) in texture. And though the corolla is rarely green, yet neither are proper leaves always green. In our wild Painted-Cup, and in some scarlet Sages, common in gardens, the leaves just under the flowers are of the brightest red or scarlet, often much brighter-colored than the corolla itself. And sometimes (as in many Cactuses, and in Carolina All-spice) there is such a regular gradation from the last leaves of the

together takes place in two ways: either parts of the same kind, or parts of different kinds, may be united. The first we may call simply the *union*, the second the *consolidation*, of parts.



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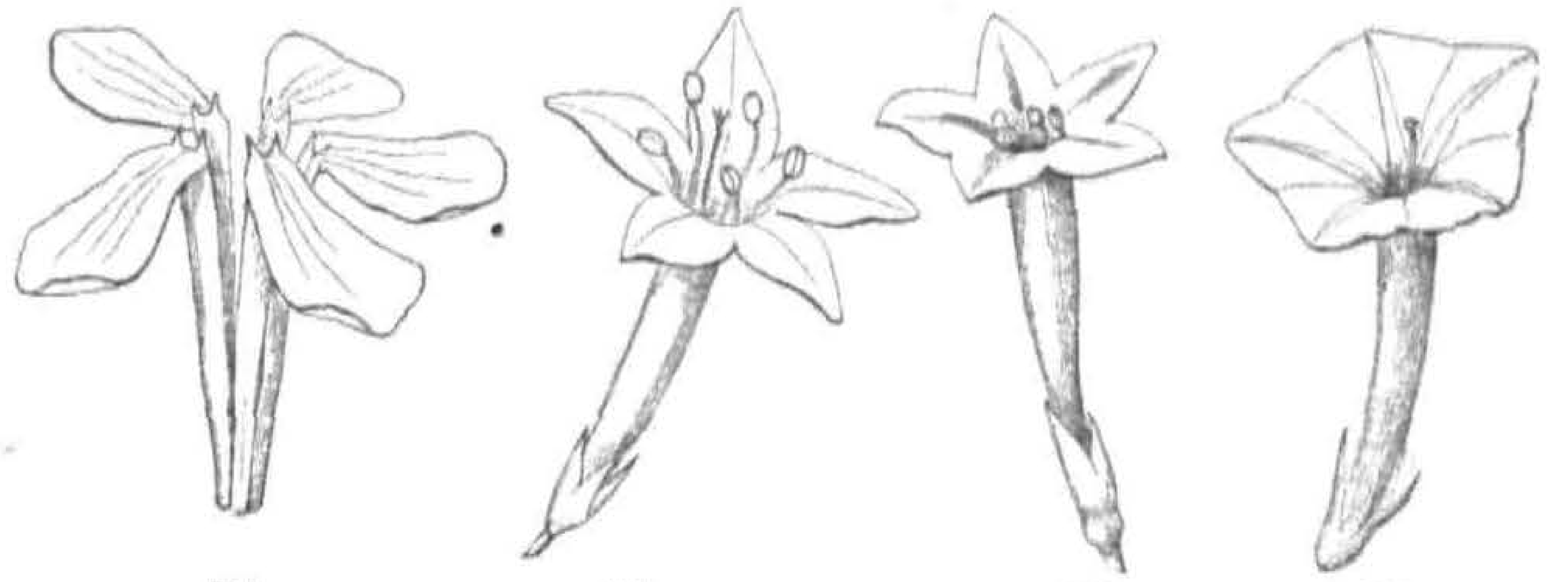
262. **Union or Cohesion** *with one another of parts of the same sort.* We very commonly find that the calyx or the corolla is a cup or tube, instead of a set of leaves. Take, for example, the flower of the Stramonium or Thorn-Apple, where both the calyx and the corolla are so (Fig. 199); likewise the common Morning-Glory, and the figures 201 to 203, where the leaves of the corolla are united into one piece, but those of the calyx are separate. Now there are numerous cases of real leaves growing together much in the same way, — those of the common Thoroughwort, and the upper pairs in Woodbines or Honeysuckles, for example (Fig. 132); so that we might expect it to occur in the leaves of the blossom also. And that this is the right view to take of it plainly appears from the transitions everywhere met with in different plants, between a calyx or a corolla of separate pieces and one forming a perfect tube or cup. Figures 200 to 203 show one complete set of such gradations in the corolla, and Fig. 204 to 206 another, in short and open corollas. How many leaves or petals each corolla is formed of may be seen by the number of points or tips, or of the notches (called *sinuses*) which answer to the intervals between them.

263. When the parts are united in this way, whether much or little, the corolla is said to be *monopetalous*, and the calyx *monosepalous*. These terms mean "of one petal," or "of one sepal"; that is, of one piece. Wherefore, taking the corolla or the calyx as a whole, we say that it is *parted* when the parts are separate almost to the base, as in Fig. 204; *cleft* or *lobed* when the notches do not extend below the middle or thereabouts, as in Fig. 205;

FIG. 199. Flower of the common Stramonium; both the calyx and the corolla with their parts united into a tube.

toothed or *dentate*, when only the tips are separate as short points *entire*, when the border is even, without points or notches, as in the



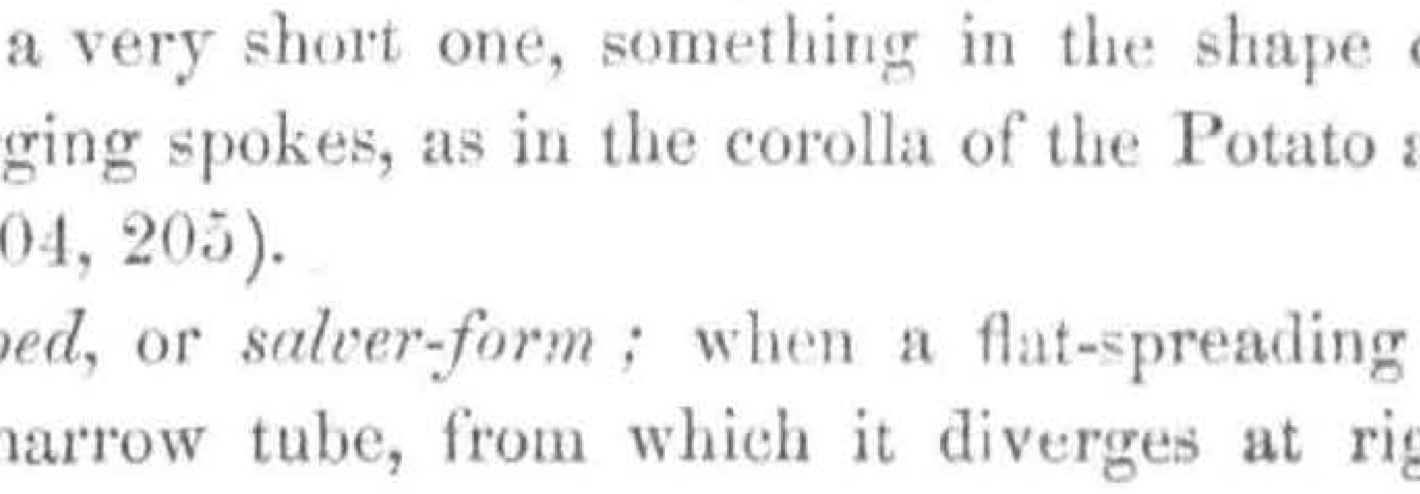
200 201 202 203

common Morning-Glory, and very nearly so in Fig. 203; and so on; — the terms being just the same as those applied to leaves and all other flat bodies, and illustrated in Lessons 8 and 9.

264. There is a set of terms applied particularly to calyxes, corollas, or other such bodies of one piece, to express their general shape, which we see is very various. The following are some of the principal: —

Wheel-shaped, or *rotate*; when spreading out at once, without a tube or with a very short one, something in the shape of a wheel or of its diverging spokes, as in the corolla of the Potato and Bitter-sweet (Fig. 204, 205).

Salver-shaped, or *salver-form*; when a flat-spreading border is raised on a narrow tube, from which it diverges at right angles,



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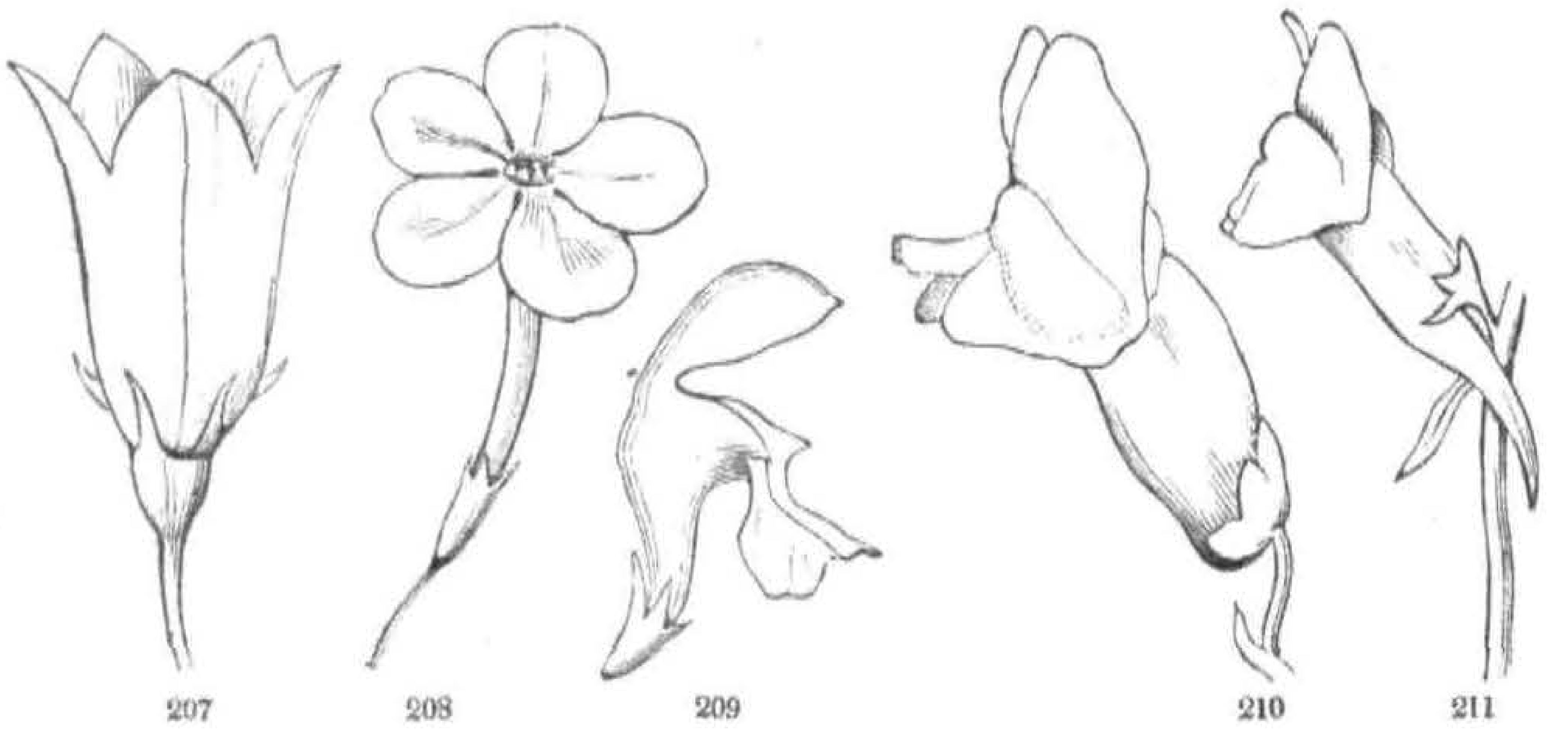
like the salver represented in old pictures, with a slender handle beneath. The corolla of the Phlox (Fig. 208) and of the Cypress-Vine (Fig. 202) are of this sort.

FIG. 200. Corolla of Soapwort (the same in Pinks, &c.), of 5 separate, long-clawed petals.
FIG. 201. Flower of Gilia or Ipomopsis coronopifolia; the parts answering to the claws of the petals of the last figure here all united into a tube.
FIG. 202. Flower of the Cypress-Vine; the petals a little farther united into a five-lobed spreading border.
FIG. 203. Flower of the small Scarlet Morning-Glory, the five petals it is composed of perfectly united into a trumpet-shaped tube, with the spreading border nearly even (or entire).
FIG. 204. Wheel-shaped and five-parted corolla of Bittersweet (Solanum Dulcamara).
FIG. 205. Wheel-shaped and five-cleft corolla of the common Potato.
FIG. 206. Almost entire and very open bell-shaped corolla of a Ground Cherry (Physalis)

Bell-shaped, or *campanulate;* where a short and broad tube widens upward, in the shape of a bell, as in Fig. 207.

Funnel-shaped, or *funnel-form;* gradually spreading at the summit of a tube which is narrow below, in the shape of a funnel or tunnel, as in the corolla of the common Morning-Glory, and of the Stramonium (Fig. 199).

Tubular; when prolonged into a tube, without much spreading at the border, as in the corolla of the Trumpet Honeysuckle, the calyx of Stramonium (Fig. 199), &c.



207 208 209 210 211

265. In most of these cases we may distinguish two parts; namely, the *tube*, or the portion all in one piece and with its sides upright or nearly so; and the *border* or *limb*, the spreading portion or summit. The limb may be entire, as in Fig. 203, but it is more commonly *lobed*, that is, partly divided, as in Fig. 202, or *parted* down nearly to the top of the tube, as in Fig. 208, &c.

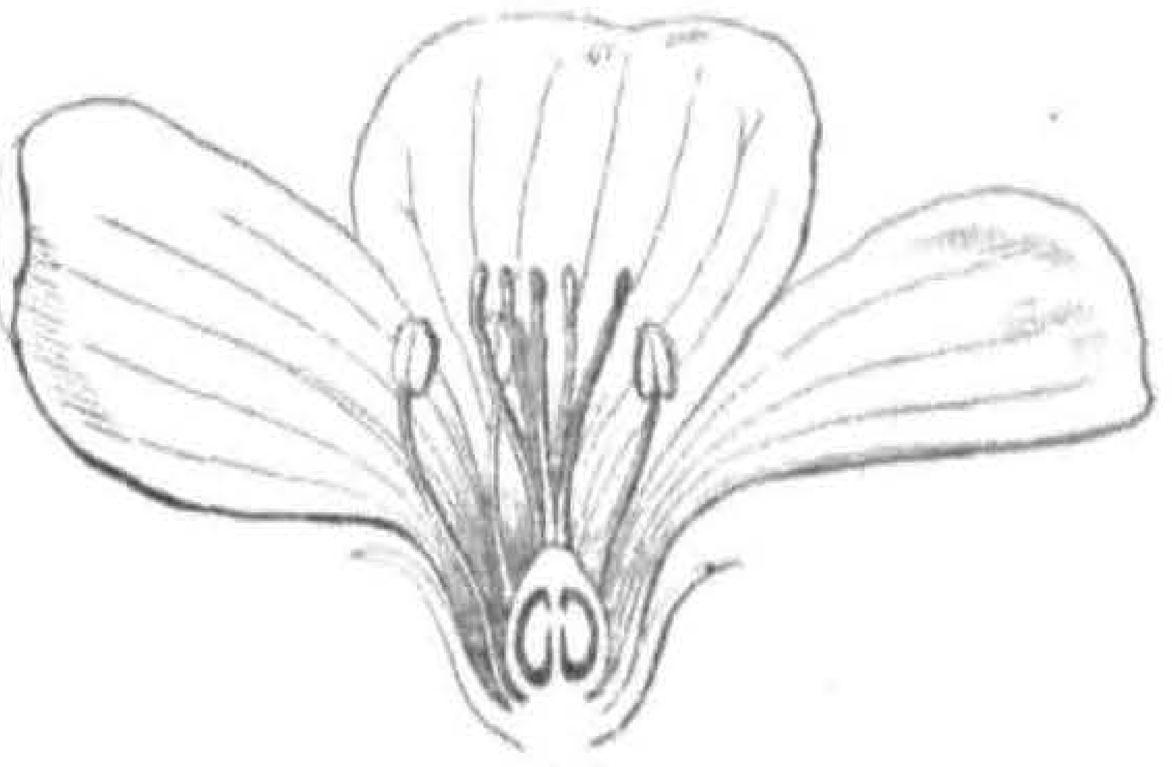
266. So, likewise, a separate petal is sometimes distinguishable into two parts; namely, into a narrowed base or stalk-like part (as in Fig. 200, where this part is peculiarly long), called the *claw*, and a spreading and enlarged summit, or body of the petal, called the *lamina* or *blade*.

267. When parts of the same set are not united (as in the Flax, Cherry, &c., Fig. 212 – 215), we call them *distinct*. Thus the sepals or the petals are distinct when not at all united with each other. As a calyx with sepals united into one body is called *monosepalous* (263, that is, one-sepalled), or sometimes *monophyllous*, that is, one-leaved; so, on the other hand, when the sepals are distinct, it is said to be

FIG. 207. Flower of the Harebell, with a campanulate or bell-shaped corolla. 208. Of a Phlox, with salver-shaped corolla. 209. Of Dead-Nettle (Lamium), with labiate *ringent* (or gaping) corolla. 210. Of Snapdragon, with labiate *personate* corolla. 211. Of Toad-Flax, with a similar corolla spurred at the base.

polysepalous, that is, composed of several or many sepals. And a corolla with distinct petals is said to be *polypetalous*.

268. **Consolidation**, *the growing together of the parts of two or more different sets.* In the most natural or pattern flower (as explained in Lessons 13 and 14), the several parts rise from the receptacle or axis in succession, like leaves upon a very short stem ; the petals just above or within the sepals, the stamens just above or within these, and then the pistils next the summit or centre. Now when contiguous parts of different sorts, one within the other, unite at their base or origin, it obscures more or less the plan of the flower, by consolidating organs which in the pattern flower are entirely separate.



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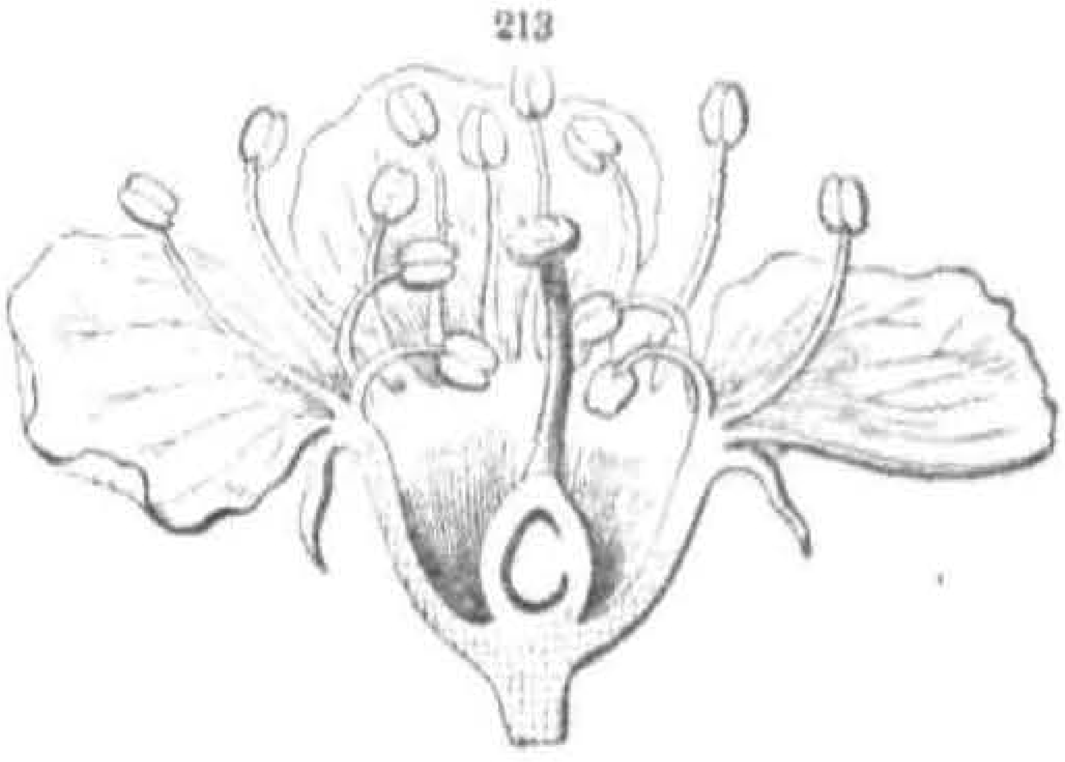

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269. The nature of this consolidation will be at once understood on comparing the following series of illustrations. Fig. 212 represents a flower of the common Flax, cut through lengthwise, so as to show the attachment (or what the botanist calls the *insertion*) of all the parts. Here they are all *inserted* on, that is grow out of, the receptacle or axis of the blossom. In other words, there is no union at all of the parts of contiguous circles. So the parts are said to be *free*. And the sepals, petals, and stamens, all springing of course from beneath the pistils, which are on the very summit of the axis, are said to be *hypogynous* (a term composed of two Greek words, meaning "under the pistil").

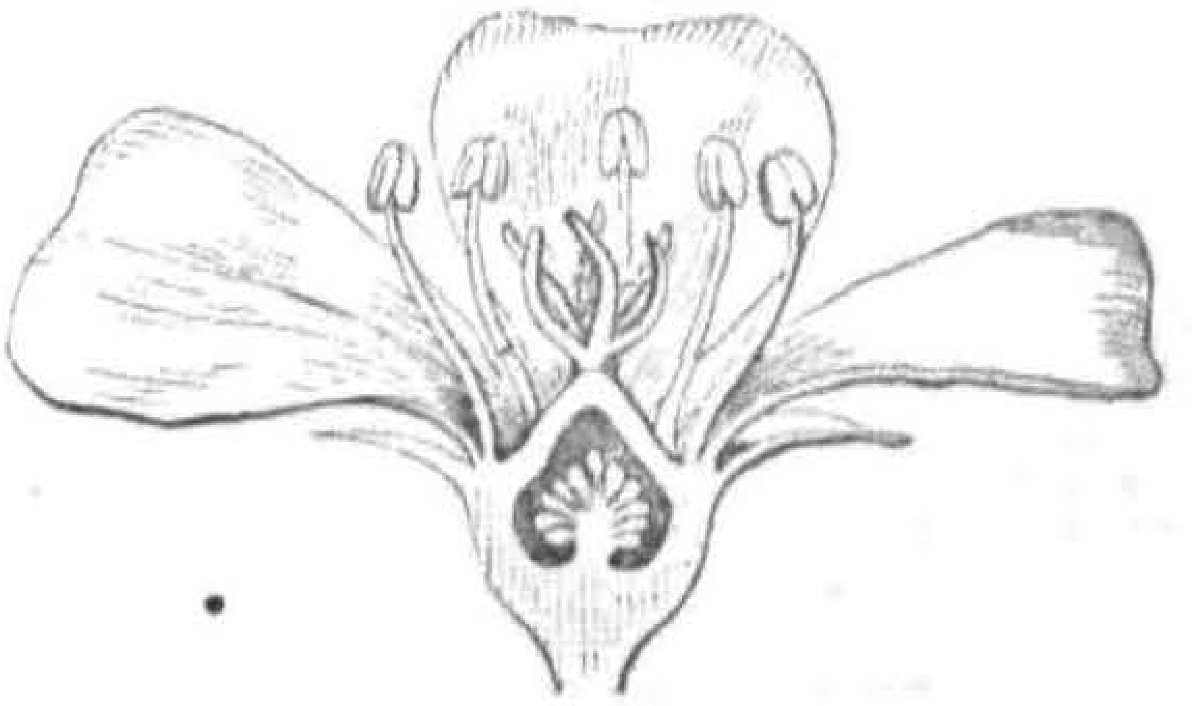

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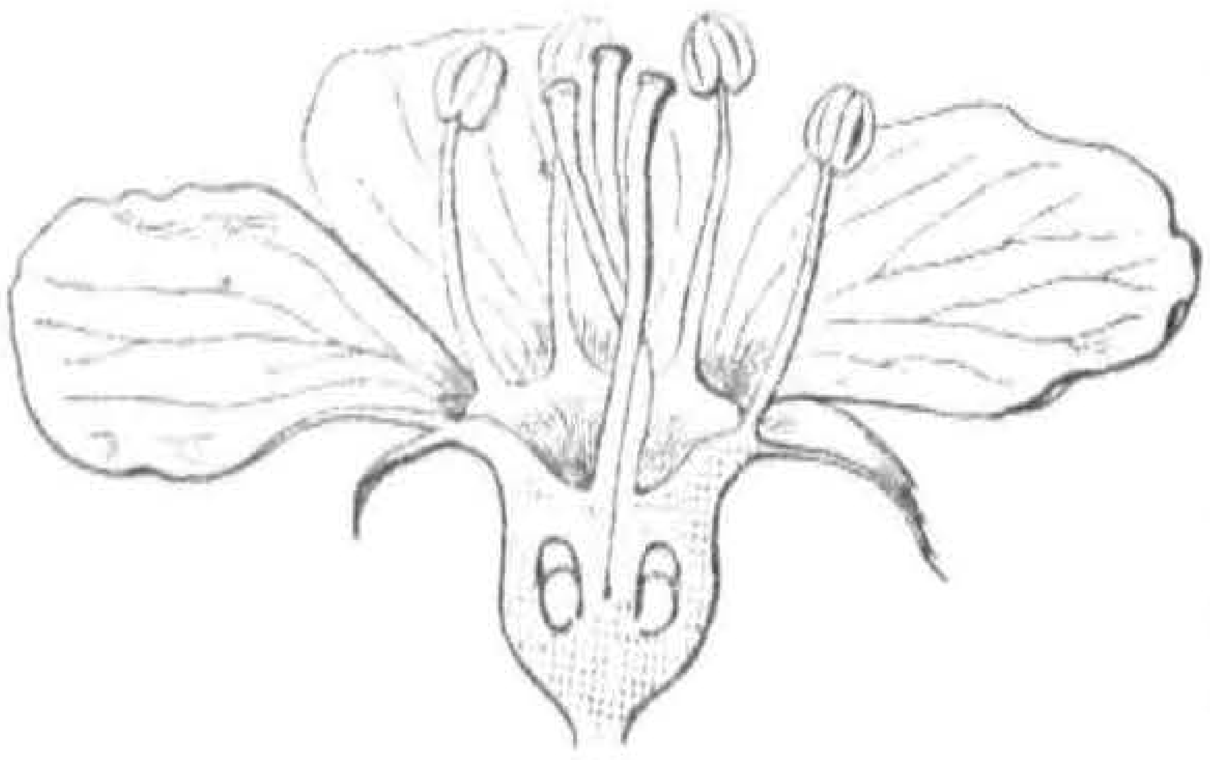
FIG. 212. A Flax-flower, cut through lengthwise.
FIG. 213. Flower of a Cherry, divided in the same way.
FIG. 214. Flower of the common Purslane, divided lengthwise.

270. Fig. 213 is a flower of a Cherry, cut through lengthwise in the same way. Here the petals and the stamens grow out of, that is, are *inserted* on, the calyx; in other words they cohere or are consolidated with the base of the calyx up to a certain height. In such cases they are said to be *perigynous* (from two Greek words, meaning around the pistil). The consolidation in the Cherry is confined to the calyx, corolla, and stamens: the calyx is still *free* from the pistil. One step more we have in

271. Fig. 214, which is a similar section of a flower of a Purslane. Here the lower part of the calyx (carrying with it of course the petals and stamens) is *coherent* with the surface of the whole lower half of the ovary. Therefore the calyx, seeming to rise from the middle of the ovary, is said to be *half superior*, instead of being *inferior*, as it is when entirely free. It is better to say, however, *calyx half-adherent* to the ovary. Every gradation occurs between such a case and that of a calyx altogether *free* or inferior, as we see in different Purslanes and Saxifrages. The consolidation goes farther,



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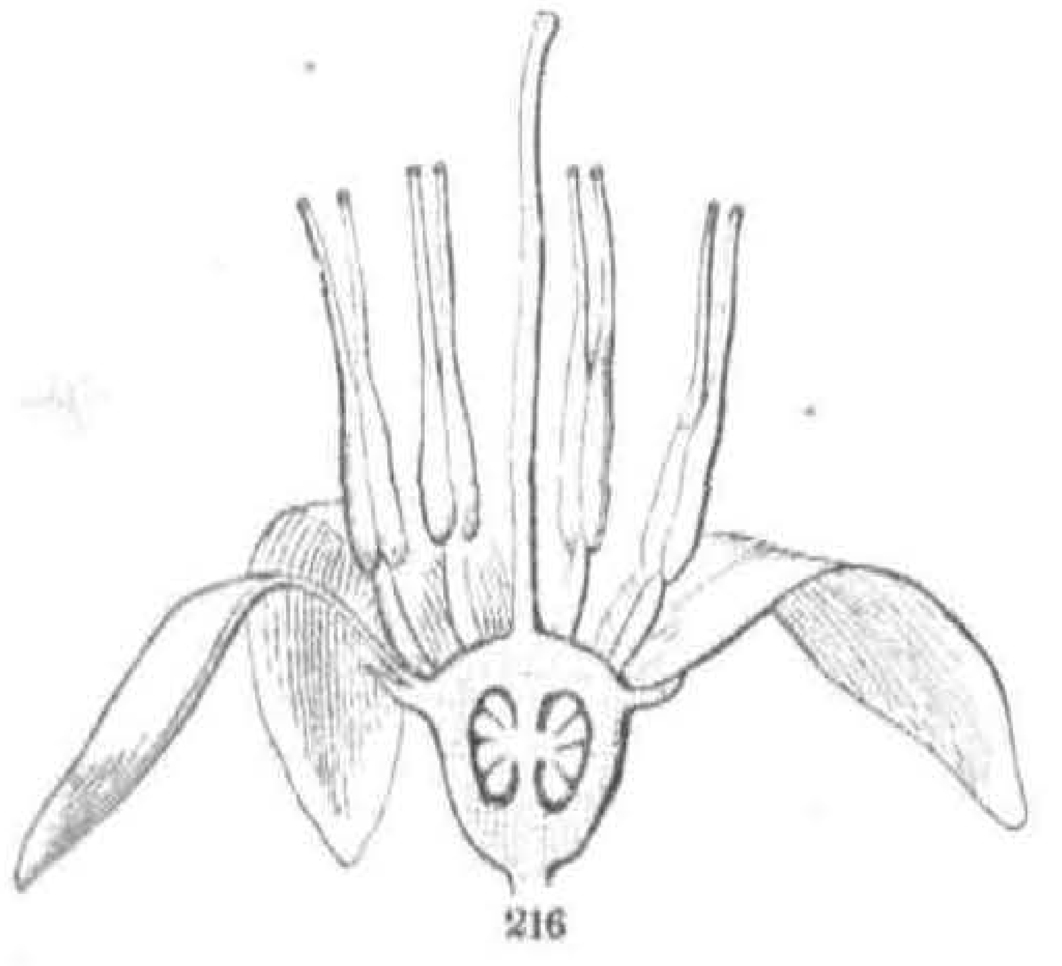


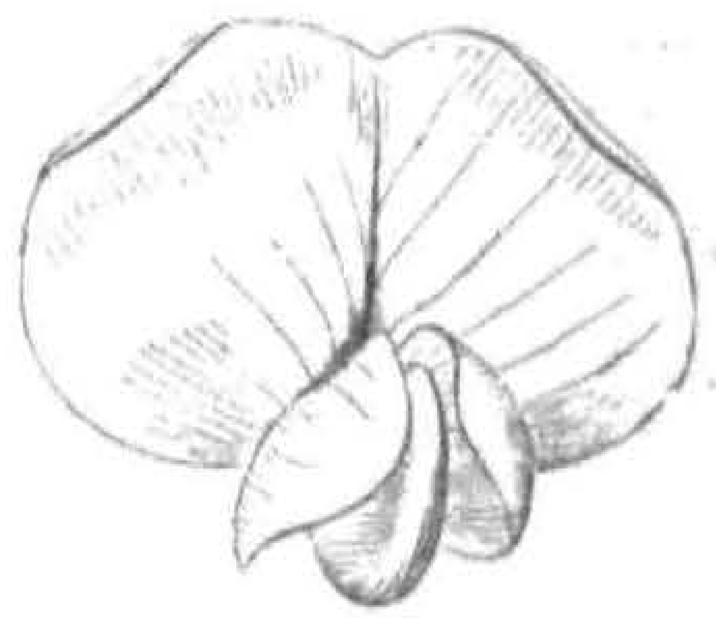
216

272. In the Apple, Quince, Hawthorn (Fig. 215), &c. Here the tube of the calyx is consolidated with the whole surface of the ovary; and its limb, or free part, therefore appears to spring from its top, instead of underneath it, as it naturally should. So the calyx is said to be *superior*, or (more properly) *adherent* to, or *coherent* with, the ovary. In most cases (and very strikingly in the Evening Primrose), the tube of the calyx is continued on more or less beyond the ovary, and has the petals and stamens consolidated with it for some distance; these last, therefore, being borne on the calyx, are said to be *perigynous*, as before (270).

FIG. 215. Flower of a Hawthorn, divided lengthwise.
FIG. 216. Flower of the Cranberry, divided lengthwise.

273. But if the tube of the calyx ends immediately at the summit of the ovary, and its lobes as well as the corolla and stamens are as it were inserted directly on the ovary, they are said to be *epigynous* (meaning on the pistil), as in Cornel, the Huckleberry, and the Cranberry (Fig. 216).

274. **Irregularity of Parts** in the calyx and corolla has already been noticed (244) as sometimes obstructing one's view of the real plan of a flower. There is infinite variety in this respect; but what has already been said will enable the student to understand these irregularities when they occur. We have only room to mention one or two cases which have given rise to particular names. A very common kind, among polypetalous (267) flowers, is



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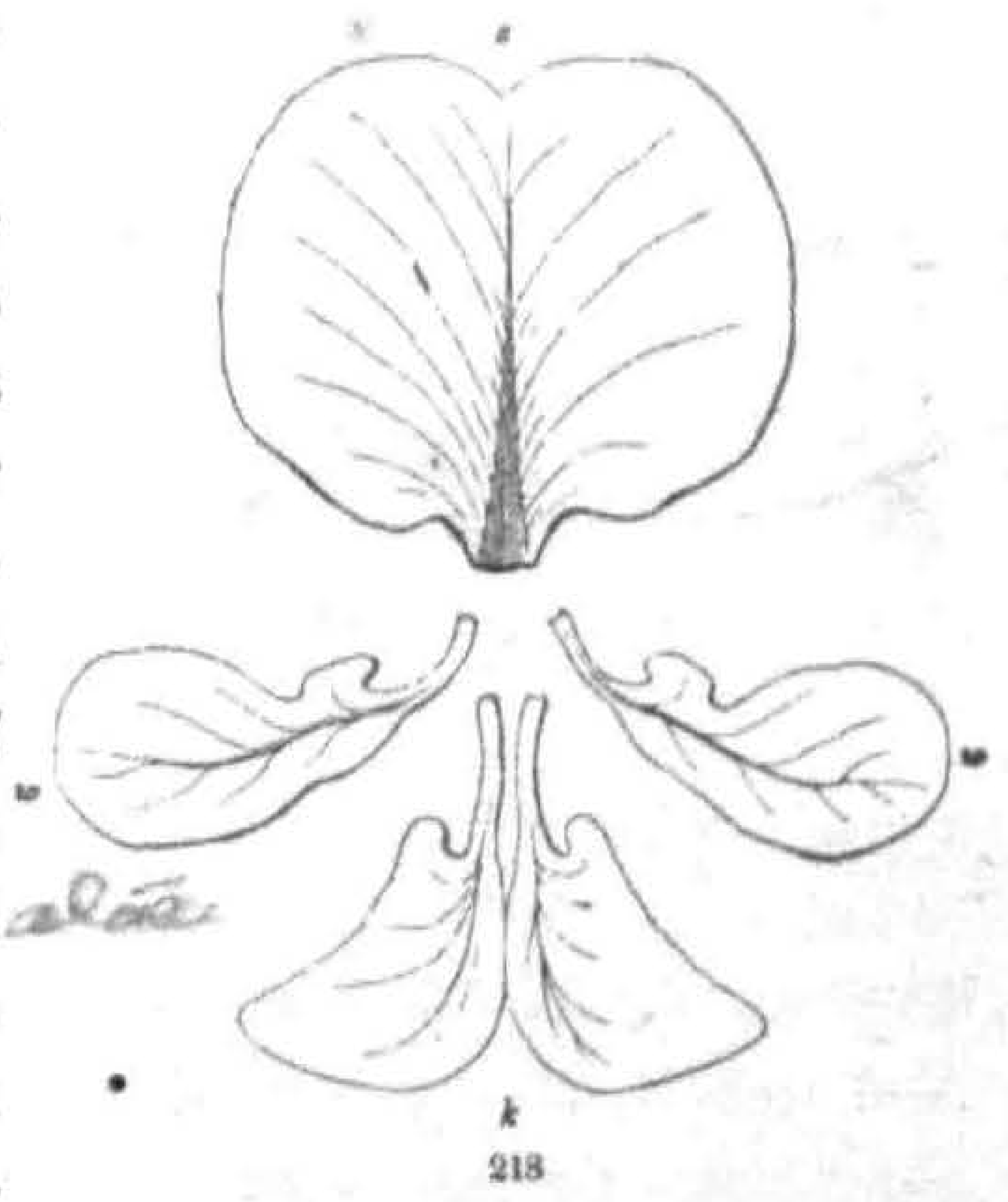
275. The *Papilionaceous* flower of the Pea, Bean, and nearly all that family. In this we have an irregular corolla of a peculiar shape, which Linnæus likened to a butterfly (whence the term, *papilio* being the Latin name for a butterfly); but the resemblance is not very obvious. The five petals of a papilionaceous corolla (Fig. 217) have received different names, taken from widely different objects. The upper and larger petal (Fig. 218, *s*), which is generally wrapped round all the rest in the bud, is called the *standard* or *banner*. The two side petals (*w*) are called the *wings*. And the two anterior ones (*k*), the blades of which commonly stick together a little, and which enclose the stamens and pistil in the flower, from their forming a body shaped somewhat like the keel, or rather the prow, of an ancient boat, are together named the *keel*.



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276. The *Labiate* or *bilabiate* (that is, *two-lipped*) flower is a very common form of the monopetalous corolla, as in the Snapdragon

FIG. 217. Front view of the papilionaceous corolla of the Locust-tree. 218. The parts of the same, displayed

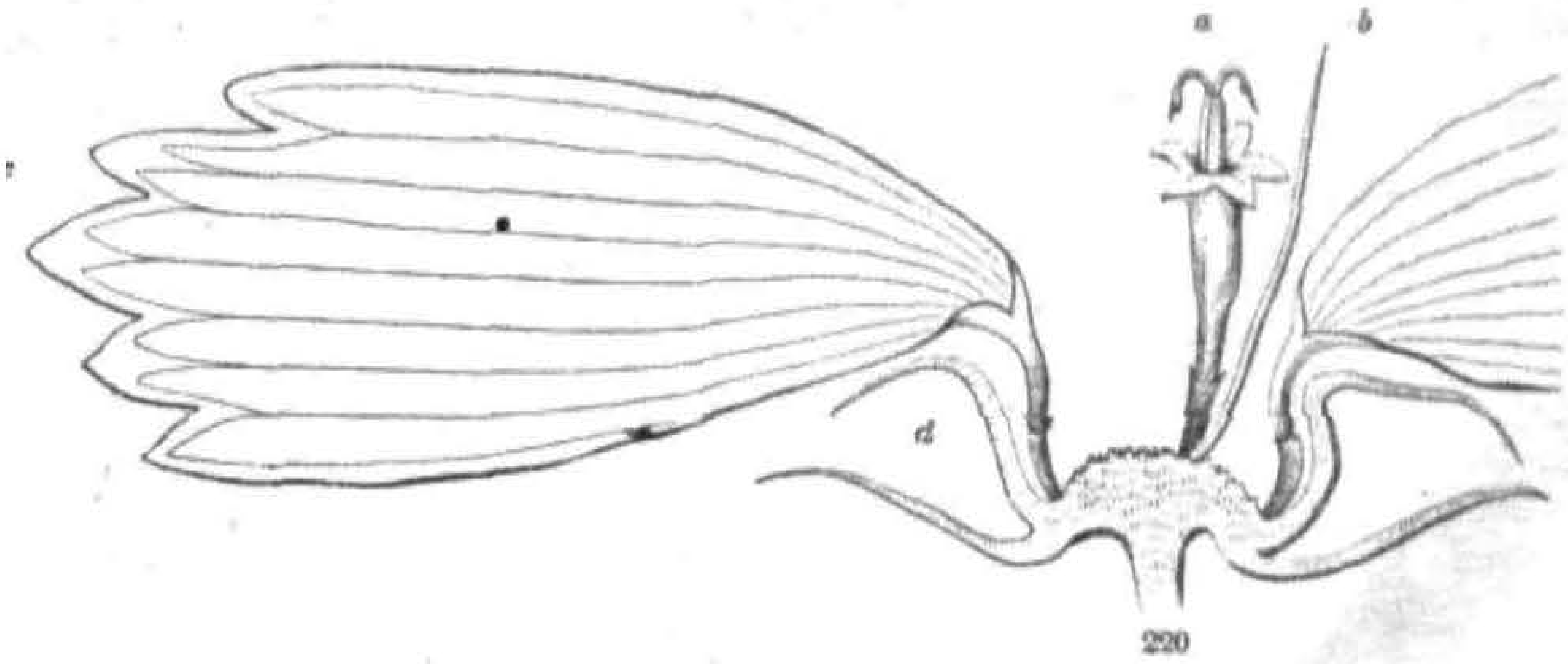
(Fig. 210), Toad-Flax (Fig. 211), Dead-Nettle (Fig. 209), Catnip, Horsemint, &c.; and in the Sage, the Catalpa, &c., the calyx also is two-lipped. This is owing to unequal union of the different parts of the same sort, as well as to diversity of shape. In the corolla two of the petals grow together higher than the rest, sometimes to the very top, and form the *upper lip*, and the three remaining ones join on the other side of the flower to form the *lower lip*, which therefore is more or less three-lobed, while the upper lip is at most only two-lobed. And if the calyx is also two-lipped, as in the Sage, — since the parts of the calyx always alternate with those of the corolla (247), — then the upper lip has three lobes or teeth, namely, is composed of three sepals united, while the lower has only two; which is the reverse of the arrangement in the corolla. So that all these flowers are really constructed on the plan of five, and not on that of two, as one would at first be apt to suppose. In Gerardia, &c. (Fig. 194, 195), the number five is evident in the calyx and corolla, but is more or less obscured in the stamens (249). In Catalpa this number is masked in the calyx by irregular union, and in the stamens by abortion. A different kind of irregular flower is seen in

219

277. The *Ligulate* or *strap-shaped* corolla of most *compound flowers*. What was called the compound flower of a Dandelion, Succory (Fig. 221), Thistle, Sunflower, Aster, Whiteweed, &c., consists of many distinct blossoms, closely crowded together into a head, and surrounded by an involucre (208). People who are not botanists commonly take the whole for one flower, the involucre for a calyx, and corollas of the outer or of all the flowers as petals. And this is a very natural mistake when the flowers around the edge have flat and open or strap-shaped corollas, while the rest are regular and tubular, but small, as in the Whiteweed, Sunflower, &c. Fig. 219 represents such a case in a Coreopsis, with the head, or so-called compound flower, cut through; and in Fig. 220 we see one of the perfect flowers of the centre or *disk*, with a regular tubular corolla (*a*), and with the slender bract (*b*) from whose

FIG. 219. Head of flowers (the so-called "compound flower") of Coreopsis, divided lengthwise.

axil it grew; and also one belonging to the margin, or *ray*, with a strap-shaped corolla (*c*), borne in the axil of a leaf or bract of



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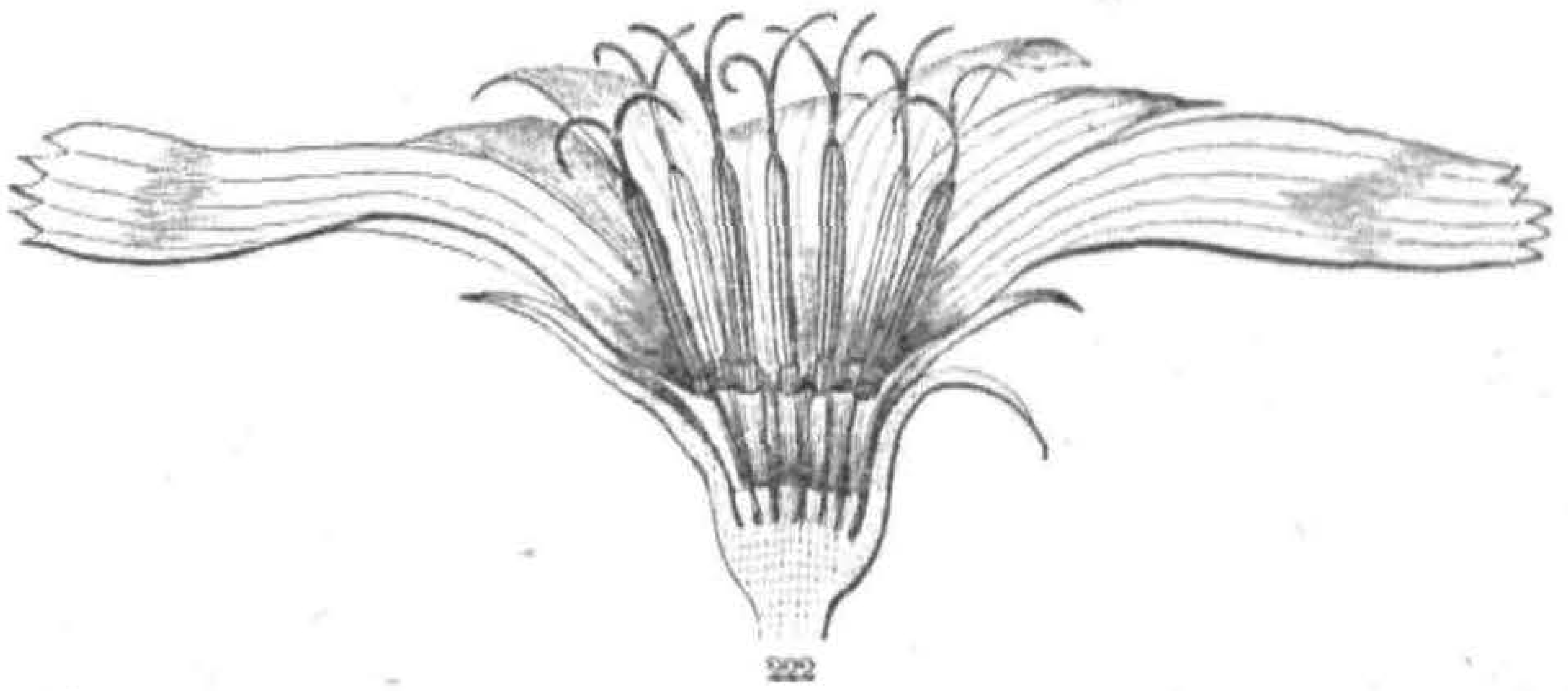
the involucre (*d*). Here the *ray-flower* consists merely of a strap-shaped corolla, raised on the small rudiment of an ovary; it is therefore a *neutral* flower, like those of the ray or margin of the cluster in Hydrangea (229, Fig. 167), only of a different shape. More commonly the flowers with a strap-shaped corolla are *pistillate*, that is, have a pistil only, and produce seed like the others, as in Whiteweed. But in the Dandelion, Succory (Fig. 221, 222),



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and all of that tribe, these flowers are perfect, that is, bear both stamens and pistils. And moreover all the flowers of the head are strap-shaped and alike.

278. Puzzling as these strap-shaped corollas appear at first view, an attentive inspection will generally reveal the plan upon which they are constructed. We can make out pretty plainly, that each one consists of five petals (the tips of which commonly appear as five teeth at the extremity), united by their contiguous edges, except on

FIG. 220. A slice of Fig. 219, more enlarged, with one tubular perfect flower (*a*) left standing on the receptacle, with its bractlet or chaff (*b*), one ligulate, neutral ray-flower (*c*), and part of another: *d*, section of bracts or leaves of the involucre.

FIG. 222. Head of flowers of Succory, cut through lengthwise and enlarged.

one side, and spread out flat. To prove that this is the case, we have only to compare such a corolla (that of Coreopsis, Fig. 220, *c*, or one from the Succory, for instance) with that of the Cardinal-flower, or of any other Lobelia, which is equally split down along one side; and this again with the less irregular corolla of the Woodbine, partially split down on one side.

221

LESSON XVI.

ÆSTIVATION, OR THE ARRANGEMENT OF THE CALYX AND COROLLA IN THE BUD.

279. Æstivation or *Præfloration* relates to the way in which the leaves of the flower, or the lobes of the calyx or corolla, are placed with respect to each other in the bud. This is of some importance in distinguishing different families or tribes of plants, being generally very uniform in each. The æstivation is best seen

FIG. 221. Compound flowers, i. e. heads of flowers, of Succory.

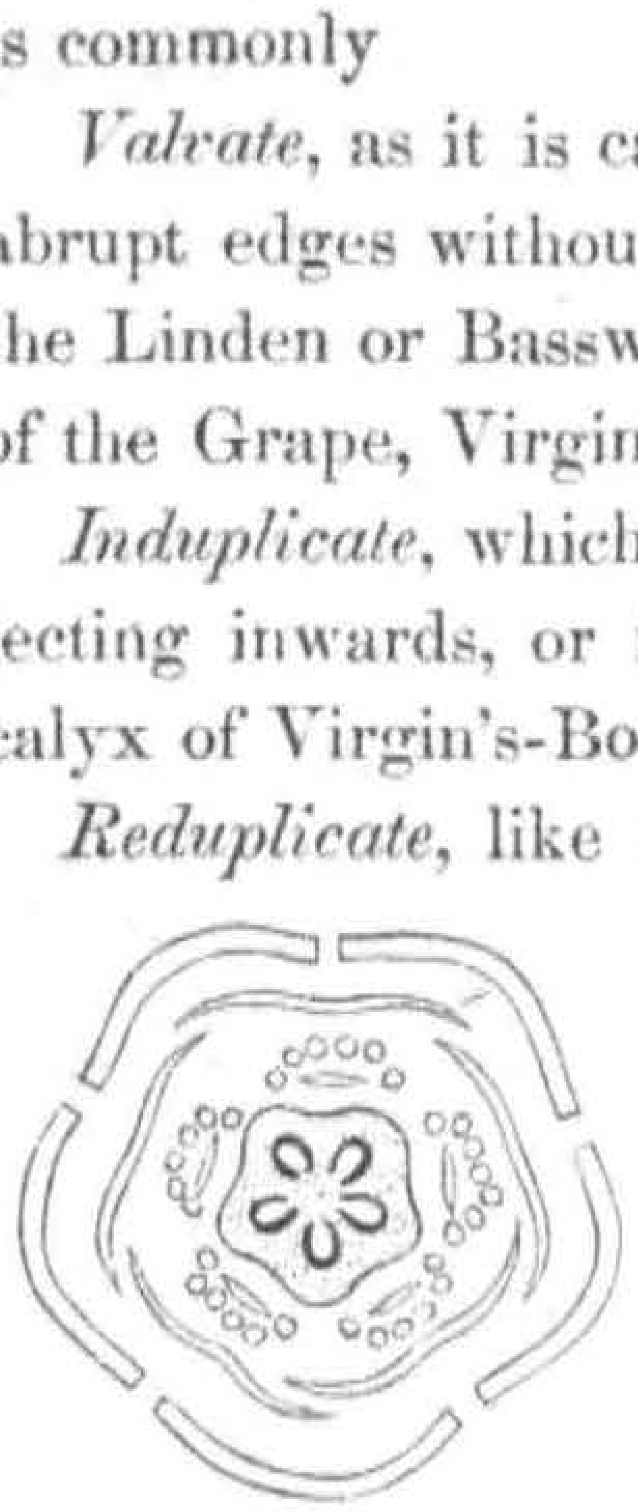
by making a horizontal slice of the flower-bud when just ready to open; and it may be expressed in diagrams, as in Fig. 223, 224.

280. The pieces of the calyx or the corolla either overlap each other in the bud, or they do not. When they do not, the æstivation is commonly

Valvate, as it is called when the pieces meet each other by their abrupt edges without any infolding or overlapping; as the calyx of the Linden or Basswood (Fig. 223) and the Mallow, and the corolla of the Grape, Virginia Creeper, &c. Or it may be

Induplicate, which is valvate with the margins of each piece projecting inwards, or involute (like the leaf in Fig. 152), as in the calyx of Virgin's-Bower and the corolla of the Potato, or else

Reduplicate, like the last, but the margins projecting outwards instead of inwards; these last being mere variations of the valvate form.



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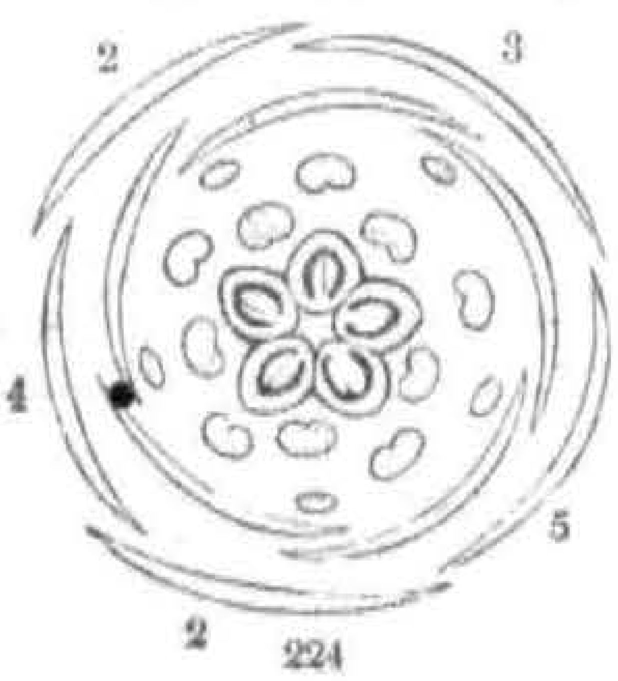
281. When the pieces overlap in the bud, it is in one of two ways: either every piece has one edge in and one edge out; or some pieces are wholly outside and others wholly inside. In the first case the æstivation is

Convolute or *twisted*, as in the corolla of Geranium (most commonly, Fig. 224), Flax (Fig. 191), and of the Mallow Family. Here one edge of every petal covers the next before it, while its other edge is covered by the next behind it. In the second case it is



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Imbricated or *imbricate*, or *breaking joints*, like shingles on a roof, as in the calyx of Geranium (Fig. 224) and of Flax (Fig. 191), and the corolla of the Linden (Fig. 223). In these cases the parts are five in number; and the regular way then is (as in the calyx of the figures above cited) to have two pieces entirely external (1 and 2), one (3) with one edge covered by the first, while the other edge covers that of the adjacent one on the other side, and two (4 and 5) wholly within, their margins at least being covered by the rest. That is, they just represent a circle of five leaves spirally arranged on the five-ranked or $\frac{2}{5}$ plan (187, 188, and Fig. 143 – 145), only with the stem shortened so as to bring the parts close together. The spiral arrangement of the parts of

FIG. 223. Section across the flower-bud of Linden.

FIG. 224. Section across the flower-bud of Geranium: the sepals numbered in their order

the blossom is the same as that of the foliage, — an additional evidence that the flower is a sort of branch. The petals of the Linden, with only one outside and one inside, as shown in Fig. 223, exhibit a gradation between the imbricated and the convolute modes. When the parts are four in number, generally two opposite ones overlap the other two by both edges. When three in number, then one is outermost, the next has one edge out and the other covered, and the third is within, being covered by the other two; as in Fig. 190. This is just the three-ranked ($\frac{1}{3}$) spiral arrangement of leaves (186, and Fig. 171).

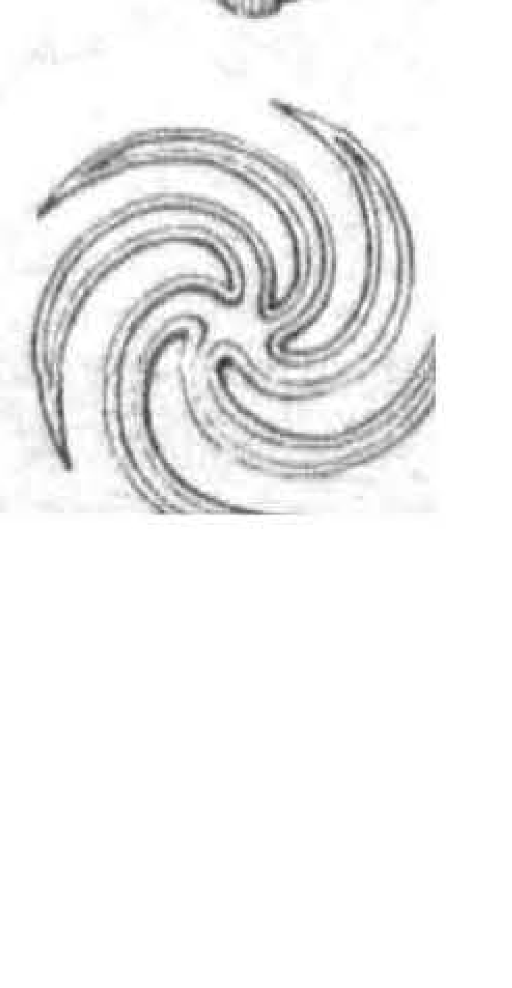
282. In the Mignonette, and some other flowers, the æstivation is *open;* that is, the calyx and corolla are not closed at all over the other parts of the flower, even in the young bud.

283. When the calyx or the corolla is tubular, the shape of the tube in the bud has sometimes to be considered, as well as the way the lobes are arranged. For example, it may be

Plaited or *plicate,* that is, folded lengthwise; and the plaits may either be turned outwards, forming projecting ridges, as in the corolla of Campanula; or turned inwards, as in the corolla of the Gentian, &c. When the plaits are wrapped round all in one direction, so as to cover one another in a convolute manner, the æstivation is said to be

Supervolute, as in the corolla of Stramonium (Fig. 225) and the Morning-Glory; and in the Morning-Glory it is twisted besides.

FIG. 225. Upper part of the corolla of a Stramonium (Datura meteloides), in the bud. Underneath is a cross-section of the same.



LESSON XVII.

MORPHOLOGY OF THE STAMENS.

284. THE STAMENS exhibit nearly the same kinds of variation in different species that the calyx and corolla do. They may be *distinct* (that is, separate from each other, 267) or united. They may be *free* (269), or else *coherent* with other parts: this concerns

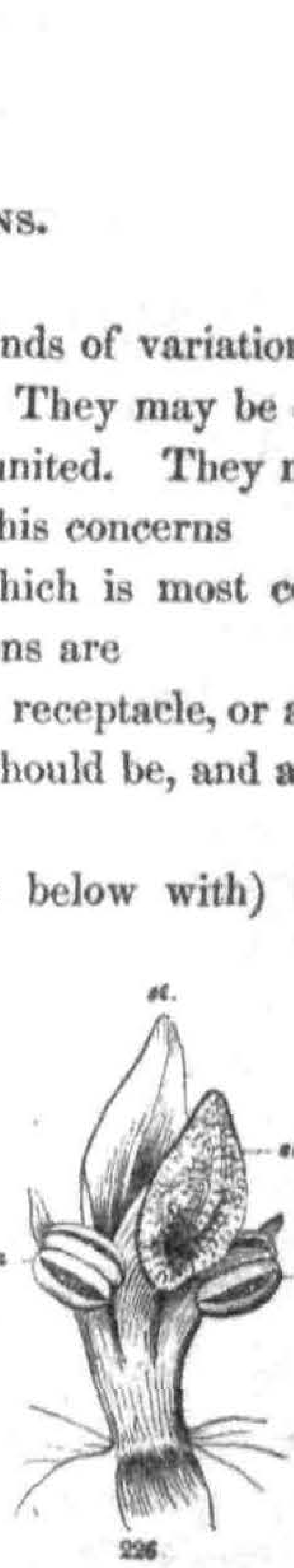
285. **Their Insertion,** or place of attachment, which is most commonly the same as that of the corolla. So, stamens are

Hypogynous (269), when they are borne on the receptacle, or axis of the flower, under the pistils, as they naturally should be, and as is shown in Fig. 212.

Perigynous, when borne on (that is coherent below with) the calyx; as in the Cherry, Fig. 213.

Epigynous, when borne on the ovary, apparently, as in Fig. 216. To these we may add

Gynandrous (from two Greek words, answering to "stamens and pistil united"), when the stamens are consolidated with the style, so as to be borne by it, as in the Lady's Slipper (Fig. 226) and all the Orchis Family. Also



Epipetalous (meaning on the petals), when they are borne by the corolla; as in Fig. 194, and in most monopetalous blossoms. As to

286. **Their Union with each other,** the stamens may be united by their filaments or by their anthers. In the former case they are

Monadelphous (from two Greek words, meaning "in one brotherhood"), when united by their filaments into one set, usually into a ring or cup below, or into a tube, as in the Mallow Family, the Passion-flower, and the Lupine (Fig. 228).

Diadelphous (in two brotherhoods), when so united in two sets, as in the Pea and almost all papilionaceous flowers (275): here the stamens are nine in one set, and one in the other (Fig. 227).

FIG. 226. Style of a Lady's Slipper (Cypripedium), and stamens united with it: *a*, *a*, the anthers of the two good stamens; *st.*, an abortive stamen, what should be its anther changed into a petal-like body; *stig.*, the stigma.

295. To discharge the pollen, the anther opens (or is *dehiscent*) at maturity, commonly by a line along the whole length of each cell, and which answers to the margin of the leaf (as in Fig. 231); but when the anthers are extrorse, this line is often on the outer face, and when introrse, on the inner face of each cell. Sometimes the anther opens only by a chink, hole, or pore at the top, as in the Azalea, Pyrola or False Wintergreen (Fig. 235), &c.; and sometimes a part of the face separates as a sort of trap-door (or valve), hinged at the top, and opening to allow the escape of the pollen, as in the Sassafras, Spice-bush, and Barberry (Fig. 236).

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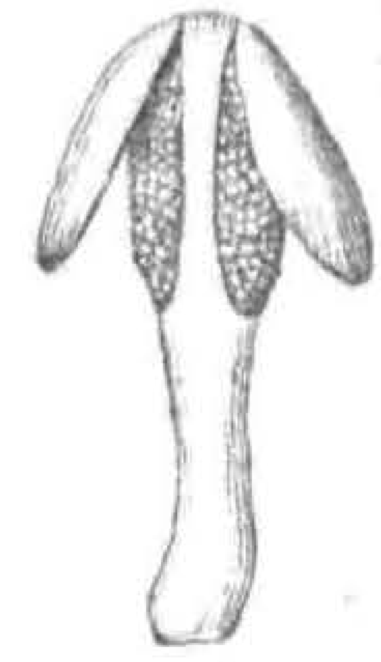
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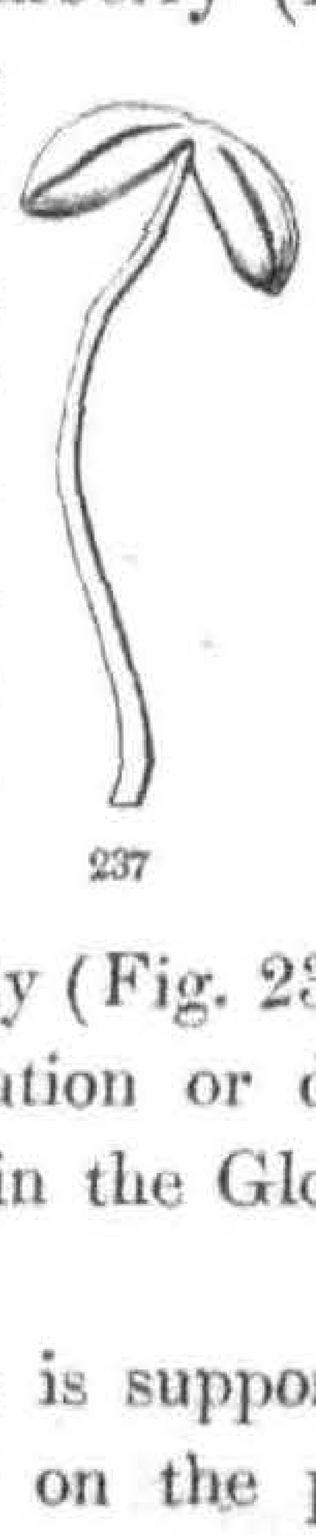
Most anthers are really four-celled when young; a slender partition running lengthwise through each cell and dividing it into two compartments, one answering to the upper, and the other to the lower, layer of the green pulp of the leaf. Occasionally the anther becomes one-celled. This takes place mostly by *confluence*, that is, the two cells running together into one, as they do slightly in Pentstemon (Fig. 237) and thoroughly in the Mallow Family (Fig. 238). But sometimes it occurs by the obliteration or disappearance of one half of the anther, as in the Globe Amaranth of the gardens (Fig. 239).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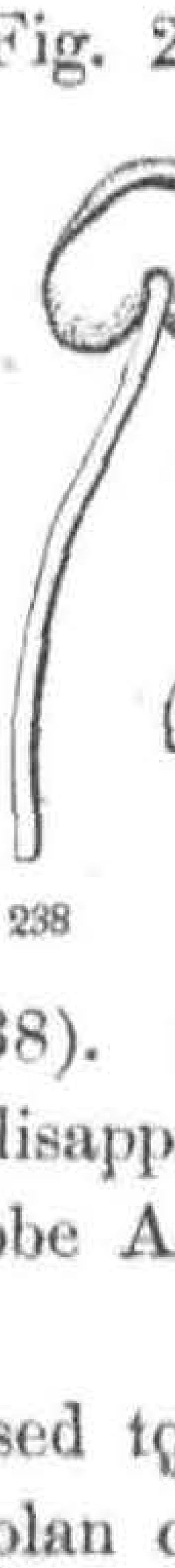
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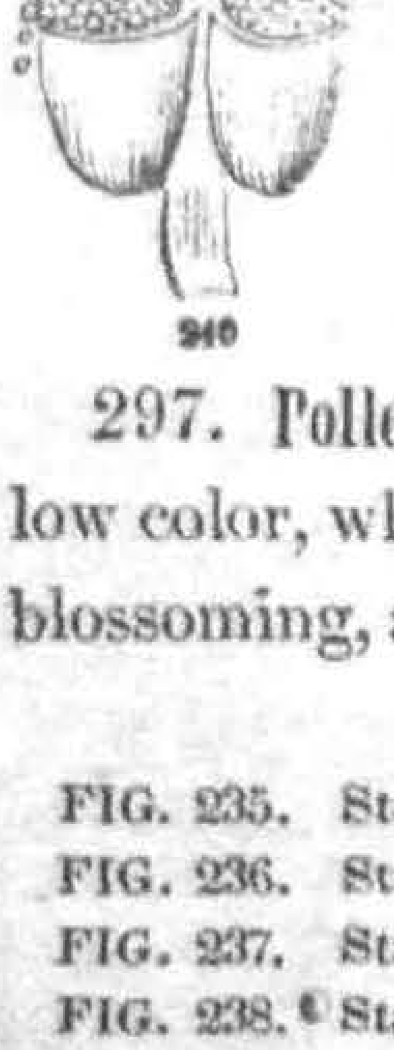
296. The way in which a stamen is supposed to be constructed out of a leaf, or rather on the plan of a leaf, is shown in Fig. 240, an ideal figure, the lower part representing a stamen with the top of its anther cut away; the upper, the corresponding upper part of a leaf. — The use of the anther is to produce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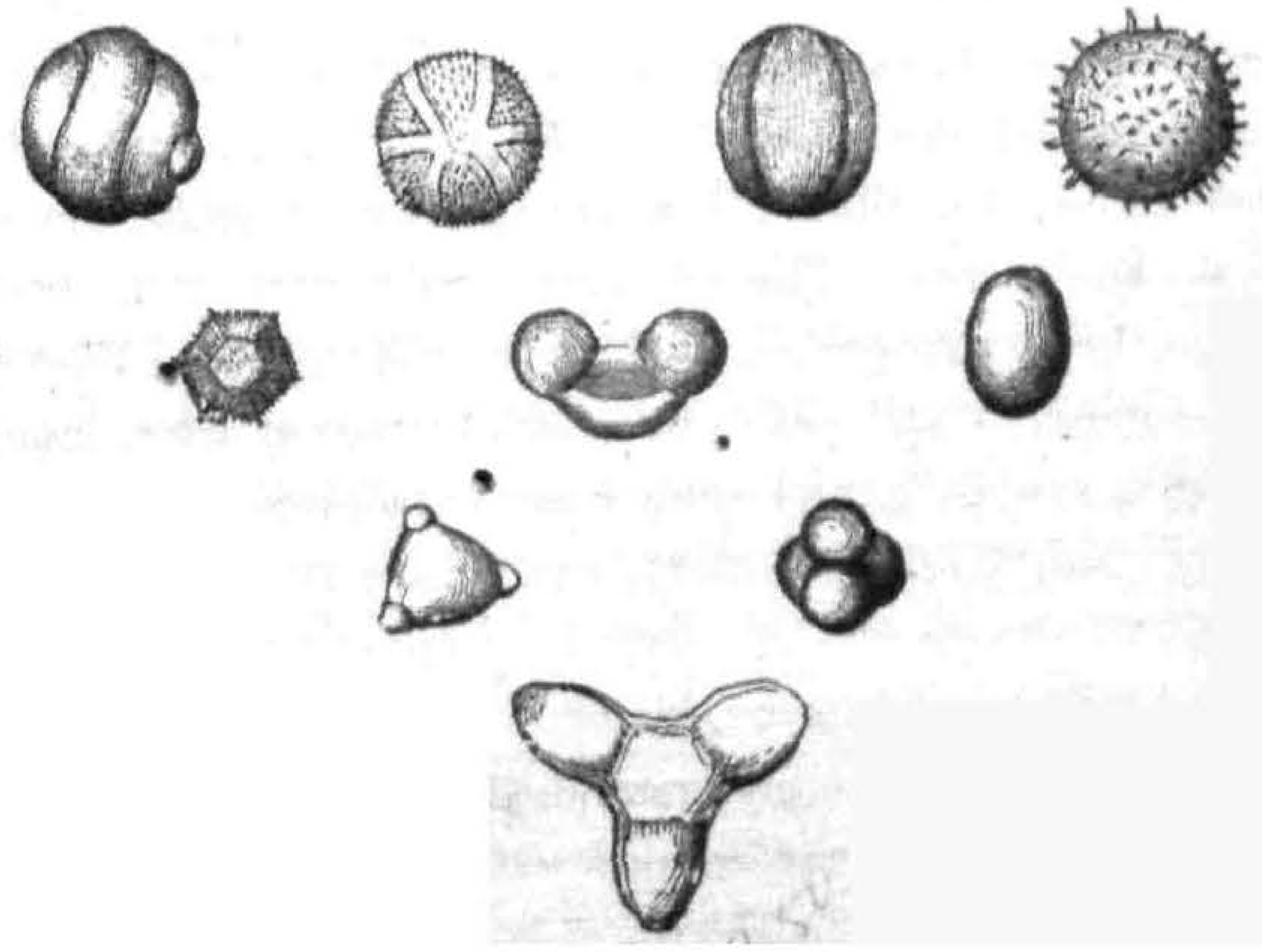
297. **Pollen.** This is the powder, or fine dust, commonly of a yellow color, which fills the cells of the anther, and is discharged during blossoming, after which the stamens generally fall off or wither away.

FIG. 235. Stamen of Pyrola; the anther opening by holes at the top.
FIG. 236. Stamen of Barberry; the anther opening by uplifted valves.
FIG. 237. Stamen of Pentstemon pubescens; anther-cells slightly confluent.
FIG. 238. Stamen of Mallow, the two cells confluent into one, opening round the margin
FIG. 239. Anther of Globe Amaranth, of only one cell; the other cell wanting.
FIG. 240 Diagram of the lower part of an anther, cut across above, and the upper part of a leaf, to show how the one answers to the other.

Under the microscope it is found to consist of grains, usually round or oval, and all alike in the same species, but very different in different plants. So that the plant may sometimes be recognized from the pollen alone.

298. A grain of pollen is made up of two coats; the outer coat thickish, but weak, and frequently adorned with lines or bands, or studded with points; the inner coat is extremely thin and delicate, but extensible, and its cavity is filled with a thickish fluid, often rendered turbid by an immense number of minute grains that float in it. When wet, the grains absorb the water and swell so much that many kinds soon burst and discharge their contents.

299. Figures 241–250 represent some common sorts of pollen, magnified one or two hundred diameters, viz.: — A pollen-grain of the Musk Plant, spirally grooved. One of Sicyos, or One-seeded Cucumber, beset with bristly points and marked by smooth bands. One of the Wild Balsam-Apple (Echinocystis), grooved lengthwise. One of Hibiscus or Rose-Mallow, studded with prickly points. One of Succory, many-sided, and dotted with fine points. A grain of the curious compound pollen of Pine. One from the Lily, smooth and oval. One from Enchanter's Nightshade, with three small lobes on the angles. Pollen of Kalmia, composed of four grains united, as in all the Heath family. A grain from an Evening Primrose, with a central body and three large lobes. The figures number from left to right, beginning at the top.



cavity of the ovary, and bears the ovules, is called the *Placenta.* Obviously a simple pistil can have but one placenta; but this is in its nature double, one half answering to each margin of the leaf. And if the ovules or seeds are at all numerous, they will be found to occupy two rows, one for each margin, as we see in Fig. 252, 172, in the Marsh-Marigold, in a Pea-pod, and the like.

309. A simple pistil obviously can have but one cavity or cell; except from some condition out of the natural order of things. But the converse does not hold true: all pistils of a single cell are not simple. Many compound pistils are one-celled.

310. A simple pistil necessarily has but one style. Its stigma, however, may be double, like the placenta, and for the same reason (305); and it often exhibits two lines or crests, as in Fig. 252, or it may even be split into two lobes.

311. **The Compound Pistil** consists of two, three, or any greater number of pistil-leaves, or carpels (305), in a circle, united into one body, at least by their ovaries. The Cultivated Flax, for example (Fig. 212), has a compound pistil composed of five simple ones with their ovaries united, while the five styles are separate. But in one of our wild species of Flax, the styles are united into one also, for about half their length. So the Common St. John's-wort of the fields has a compound ovary, of three united carpels, but the three styles are separate (Fig. 255), while some of our wild, shrubby species have the styles also combined into one (Fig. 256), although in the fruit they often split into three again. Even the ovaries may only partially combine with each other, as we see in different species of Saxifrage, some having their two pistils nearly separate, while in others they

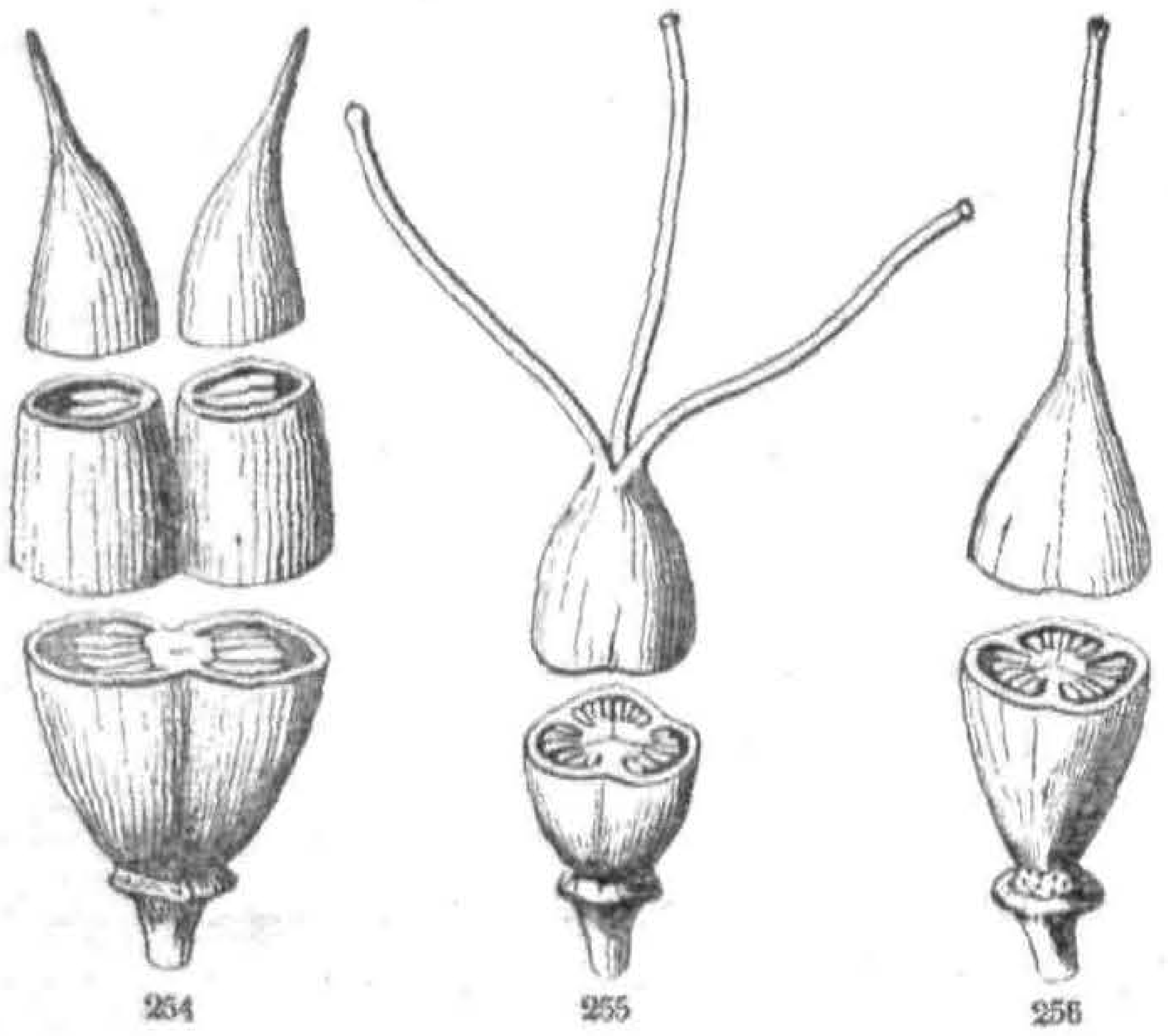


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FIG. 254. Pistil of a Saxifrage, of two simple carpels or pistil-leaves, united at the base only, cut across both above and below.

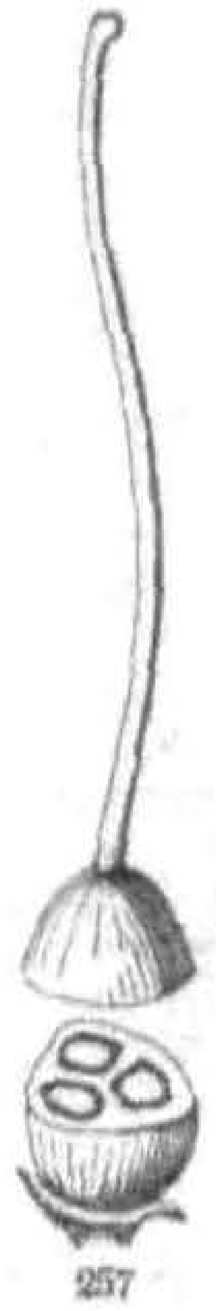
FIG. 255. Compound pistil of common St. John's-wort, cut across: styles separate.

FIG. 256. The same of shrubby St. John's-wort; the three styles united into one.

are joined at the base only, or else below the middle (as in Fig. 254), and in some they are united quite to the top.

312. Even when the styles are all consolidated into one, the stigmas are often separate, or enough so to show by the number of their lobes how many simple pistils are combined to make the compound one. In the common Lily, for instance, the three lobes of the stigma, as well as the three grooves down the ovary, plainly tell us that the pistil is made of three combined. But in the Day-Lily the three lobes of the stigma are barely discernible by the naked eye, and in the Spiderwort (Fig. 257) they are as perfectly united into one as the ovaries and styles are. Here the number of cells in the ovary alone shows that the pistil is compound. These are all cases of

313. **Compound Pistils with two or more Cells**, namely, with as many cells as there are simple pistils, or carpels, that have united to compose the organ. They are just what would be formed if the simple pistils (two, three, or five in a circle, as the case may be), like those of a Pæony or Stonecrop, all pressed together in the centre of the flower, were to cohere by their contiguous parts.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314. As each simple ovary has its placenta, or seed-bearing line (308), at the inner angle, so the resulting compound ovary has as many *axile placentæ* (that is, as many placentæ in the axis or centre) as there are pistil-leaves in its composition, but all more or less consolidated into one. This is shown in the cross-sections, Fig. 254 – 256, &c.

315. The partitions (or *Dissepiments*, as they are technically named) of a compound ovary are accordingly part of the walls or the sides of the carpels which compose it. Of course they are double, one layer belonging to each carpel; and in ripe pods they often split into the two layers.

316. We have described only one, though the commonest, kind of compound pistil. There are besides

317. **One-celled Compound Pistils.** These are of two sorts, those with *axile*, and those with *parietal placentæ*. That is, first, where the ovules or seeds are borne in the axis or centre of the ovary, and, secondly, where they are borne on its walls. The first of these cases, or that

FIG. 257. Pistil of Spiderwort (Tradescantia): the three-celled ovary cut across.

318. **With a Free Central Placenta**, is what we find in Purslane (Fig. 214), and in most Chickweeds (Fig. 258, 259) and Pinks. The difference between this and the foregoing case is only that the delicate partitions have very early vanished; and traces of them may often be detected. Or sometimes this is a variation of the mode

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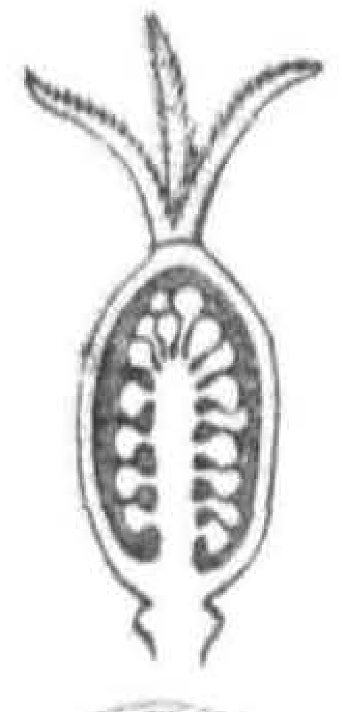

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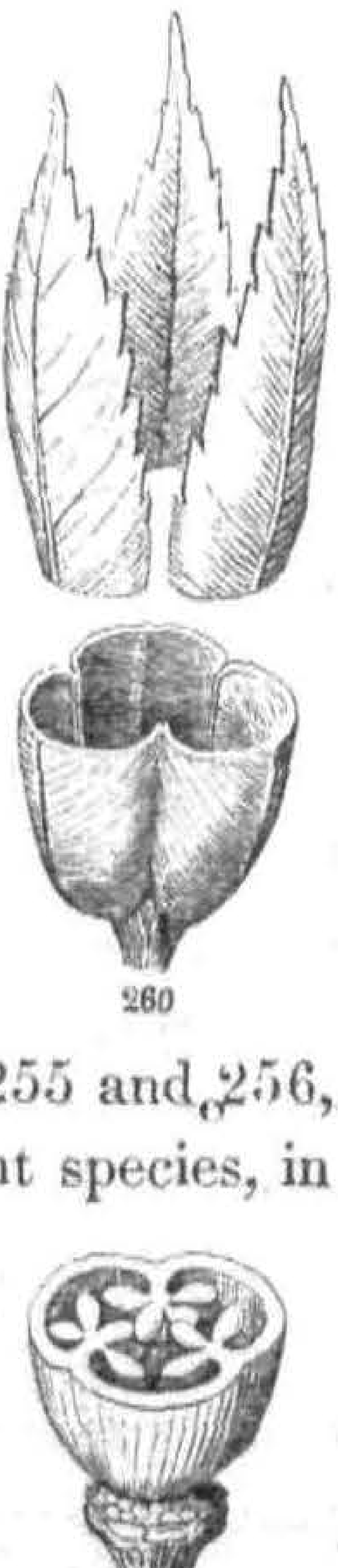
319. **With Parietal Placentæ**, namely, with the ovules and seeds borne on the sides or wall (*parietes*) of the ovary. The pistil of the Prickly Poppy, Bloodroot, Violet, Frost-weed (Fig. 261), Gooseberry, and of many Hypericums, are of this sort. To understand it perfectly, we have only to imagine two, three, or any number of carpel-leaves (like that of Fig. 251), arranged in a circle, to unite by their contiguous edges, and so form one ovary or pod (as we have endeavored to show in Fig. 260); — very much as in the Stramonium (Fig. 199) the five petals unite by their edges to compose a monopetalous corolla, and the five sepals to form a tubular calyx. Here each carpel is an open leaf, or partly open, bearing ovules along its margins; and each placenta consists of the contiguous margins of two pistil-leaves grown together.



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320. All degrees occur between this and the several-celled ovary with the placentæ in the axis. Compare, for illustration, the common St. John's-worts, Fig. 255 and 256, with Fig. 262, a cross-section of the ovary of a different species, in which the three large placentæ meet in the axis, but scarcely unite, and with Fig. 263, a similar section of the ripe pod of the same plant, showing three parietal placentæ borne on imperfect partitions projecting a little way into the general cell. Fig. 261 is the same in plan, but with hardly any trace of partitions; that is, the united edges of the leaves only slightly project into the cell.

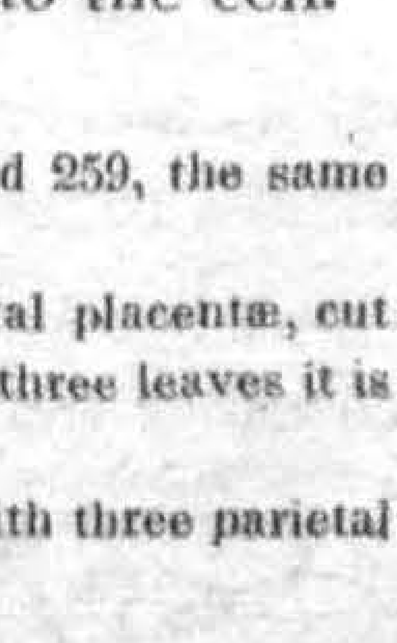

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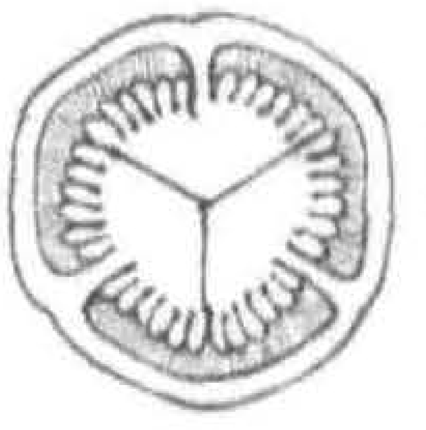
FIG. 258. Pistil of a Sandwort, with the ovary divided lengthwise; and 259, the same divided transversely, to show the free central placenta.

FIG. 260. Plan of a one-celled ovary of three carpel-leaves, with parietal placentæ, cut across below, where it is complete; the upper part showing the top of the three leaves it is composed of, approaching, but not united.

FIG. 261 Cross-section of the ovary of Frost-weed (Helianthemum), with three parietal placentæ, bearing ovules.

321. The ovary, especially when compound, is often covered by and united with the tube of the calyx, as has already been explained (272). We describe this by saying either "ovary adherent," or "calyx adherent," &c. Or we say "*ovary inferior*," when the tube of the calyx is adherent throughout to the surface of the ovary, so that its lobes, and all the rest of the flower, appear to be borne on its summit, as in Fig. 215 and Fig. 216; or "*half-inferior*," as in the Purslane (Fig. 214), where the calyx is adherent part way up; or "*superior*," where the calyx and the ovary are not combined, as in the Cherry (Fig. 213) and the like, that is, where these parts are *free*. The term "ovary superior," therefore, means just the same as "calyx inferior"; and "ovary inferior," the same as "calyx superior."



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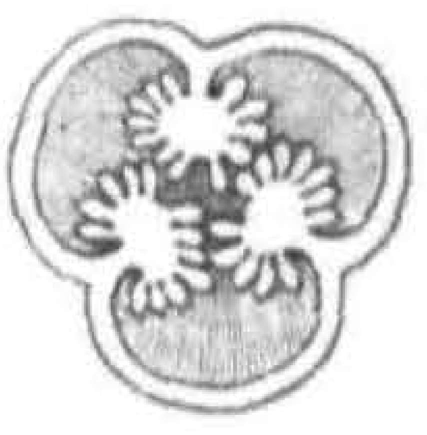

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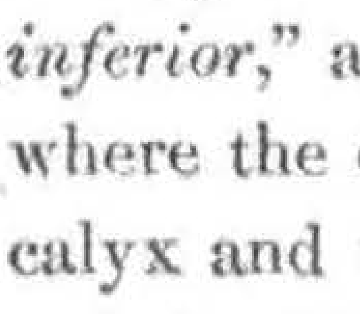
322. **Open or Gymnospermous Pistil.** This is what we have in the whole Pine family, the most peculiar, and yet the simplest, of all pistils. While the ordinary simple pistil in the eye of the botanist represents a leaf rolled together into a closed pod (305), those of the Pine, Larch (Fig. 264), Cedar, and Arbor-Vitæ (Fig. 265, 266) are plainly open leaves, in the form of scales, each bearing two or more ovules on the inner face, next the base. At the time of blossoming, these pistil-leaves of the young cone diverge, and the pollen, so abundantly shed from the staminate blossoms, falls directly upon the exposed ovules. Afterwards the scales close over each other until the seeds are ripe. Then they separate again, that the seeds may be shed. As their ovules and seeds are not enclosed in a pod, all such plants are said to be *Gymnospermous*, that is, *naked-seeded*.



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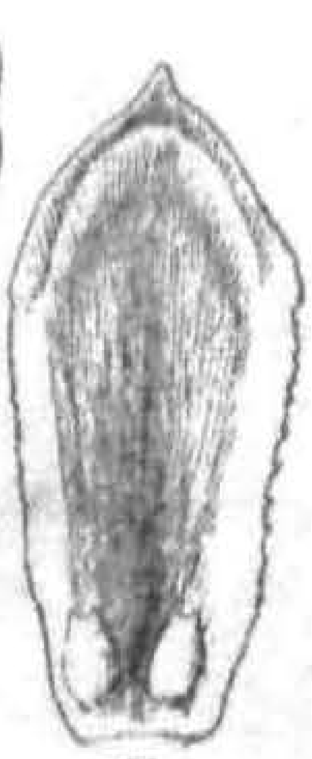

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FIG. 262. Cross-section of the ovary of Hypericum graveolens. 263. Similar section of the ripe pod of the same.

FIG. 264. A pistil, that is, a scale of the cone, of a Larch, at the time of flowering; inside view, showing its pair of naked ovules.

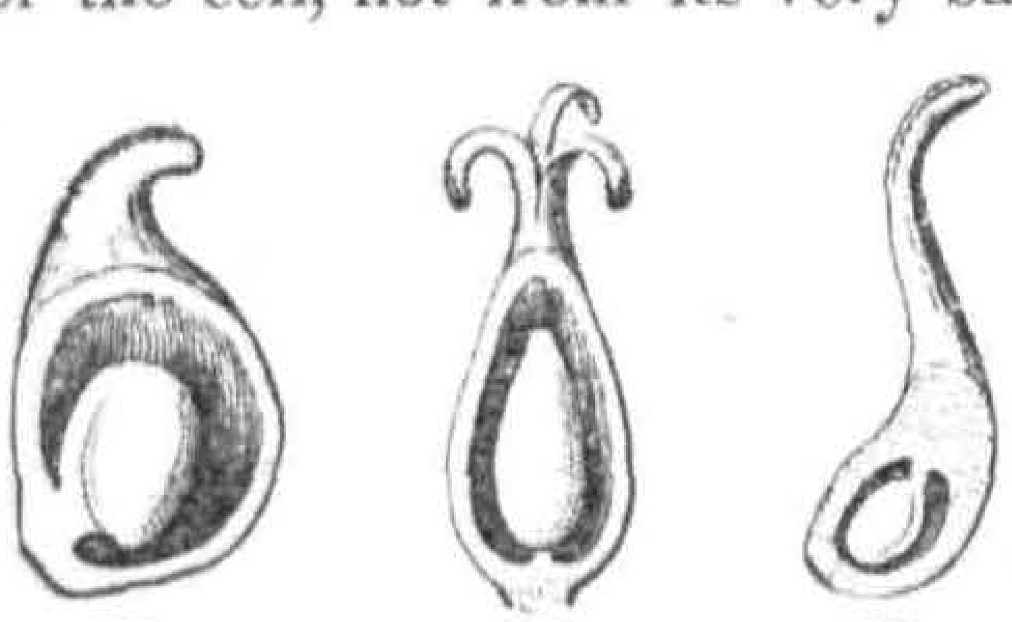
FIG. 265. Branchlet of the American Arbor-Vitæ, considerably larger than in nature, terminated by its pistillate flowers, each consisting of a single scale (an open pistil), together forming a small cone.

FIG. 266. One of the scales or pistils of the last, removed and more enlarged, the inside exposed to view, showing a pair of ovules on its base.

323. **Ovules** (234). These are the bodies which are to become seeds. They are either *sessile*, that is, stalkless, or else borne on a stalk, called the *Funiculus*. They may be produced along the whole length of the cell, or only at some part of it, generally either at the top or the bottom. In the former case they are apt to be numerous; in the latter, they may be few or single (*solitary*, Fig. 267 – 269). As to their direction, ovules are said to be

Horizontal, when they are neither turned upwards nor downwards, as in Fig. 252, 261;

Ascending, when rising obliquely upwards, usually from the side of the cell, not from its very base, as in the Buttercup (Fig. 267), and the Purslane (Fig. 214);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Erect, when rising upright from the base of the cell, as in the Buckwheat (Fig. 268);

Pendulous, when hanging from towards the top, as in the Flax (Fig. 212); and

Suspended, when hanging perpendicularly from the very summit of the cell, as in the Anemone (Fig. 269), Dogwood, &c. All these terms equally apply to seeds.

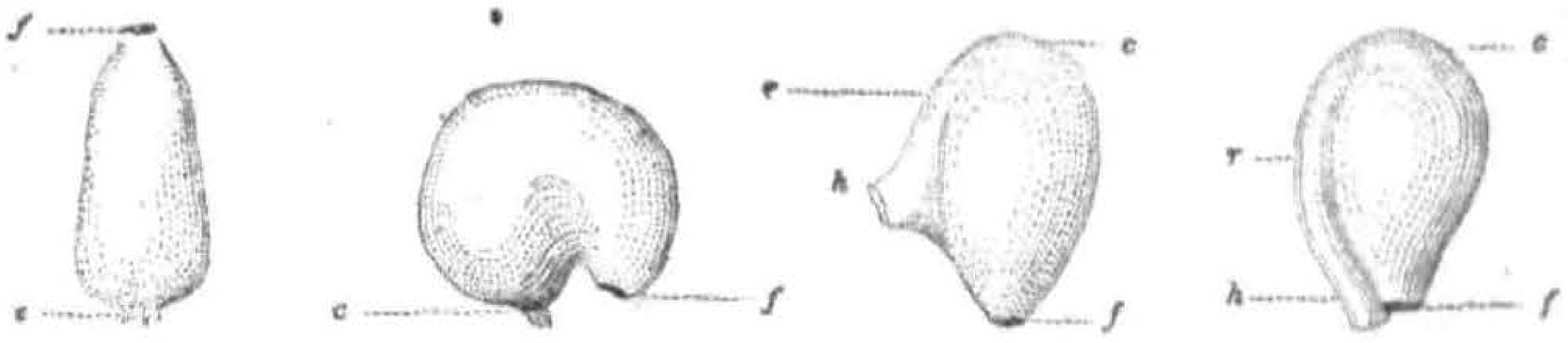
324. An ovule consists of a pulpy mass of tissue, the *Nucleus* or kernel, and usually of one or two coats. In the nucleus the embryo is formed, and the coats become the skin or coverings of the seed. There is a hole (*Orifice* or *Foramen*) through the coats, at the place which answers to the apex of the ovule. The part by which the ovule is attached is its base; the point of attachment, where the ripe seed breaks away and leaves a scar, is named the *Hilum*. The place where the coats blend, and cohere with each other and with the nucleus, is named the *Chalaza*. We will point out these parts in illustrating the four principal kinds of ovule. These are not difficult to understand, although ovules are usually so small that a good magnifying-glass is needed for their examination. Moreover, their names, all taken from the Greek, are unfortunately rather formidable.

325. The simplest sort, although the least common, is what is called the

Orthotropous, or *straight* ovule. The Buckwheat affords a good

FIG. 267. Section of the ovary of a Buttercup, lengthwise, showing its ascending ovule.
FIG. 268. Section of the ovary of Buckwheat, showing the erect ovule.
FIG. 269. Section of the ovary of Anemone, showing its suspended ovule

instance of it: it is shown in its place in the ovary in Fig. 268, also detached in Fig. 270, and a much more magnified diagram of it in Fig. 274. In this kind, the orifice (*f*) is at the top, the chalaza and the hilum (*c*) are blended at the base or point of attachment, which is at the opposite end; and the axis of the ovule is straight.



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If such an ovule were to grow on one side more than on the other, and double up, or have its top pushed round as it enlarges, it would become a

Campylotropous or *curved* ovule, as in Cress and Chickweed (Fig. 271). Here the base remains as in the straight kind, but its apex with the orifice is brought round close to it. — Much the most common form of all is the

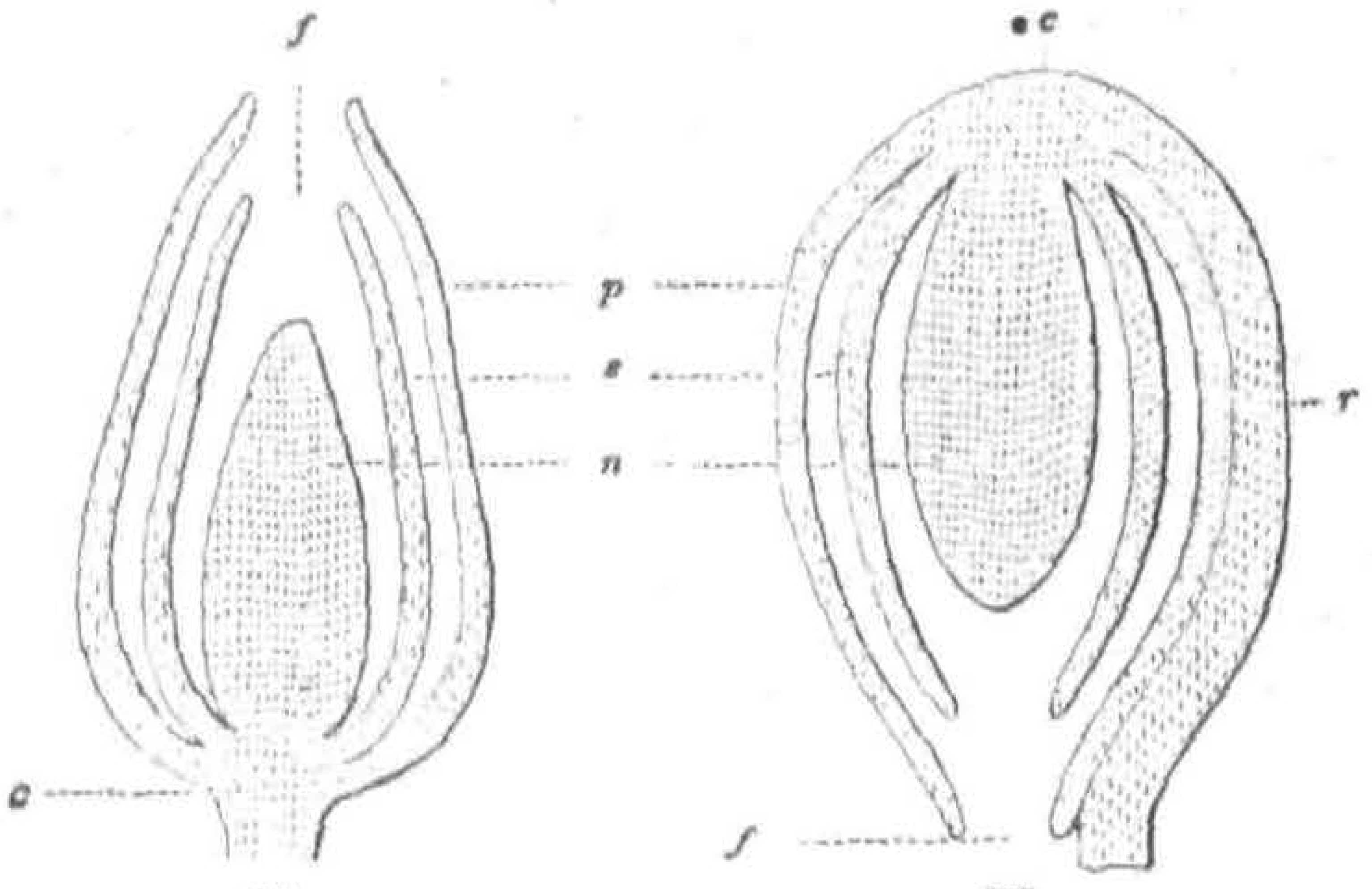
Anatropous or *inverted* ovule. This is shown in Fig. 267, and 273; also a much enlarged section lengthwise, or diagram, in Fig. 275. To understand it, we have only to suppose the first sort (Fig. 270) to be inverted on its stalk, or rather to have its stalk bent round, applied to one side of the ovule lengthwise, and to grow fast to the coat down to near the orifice (*f*); the hilum, therefore, where the seed-stalk is to break away (*h*), is close to the orifice; but the chalaza (*c*) is here at the top of the ovule; between it and the hilum runs a ridge or cord, called the *Rhaphe* (*r*), which is simply that part of the stalk which, as the ovule grew and turned over, adhered to its surface. — Lastly, the

Amphitropous or *half-anatropous* ovule (Fig. 272) differs from the last only in having a shorter rhaphe, ending about half-way between the chalaza and the orifice. So the hilum or attachment is not far from the middle of one side, while the chalaza is at one end and the orifice at the other.

326. The internal structure of the ovule is sufficiently displayed in the subjoined diagrams, representing a longitudinal slice of two

FIG. 270. Orthotropous ovule of Buckwheat: *c*, hilum and chalaza; *f*, orifice.
FIG. 271. Campylotropous ovule of a Chickweed: *c*, hilum and chalaza; *f*, orifice.
FIG. 272. Amphitropous ovule of Mallow: *f*, orifice; *h*, hilum; *r*, rhaphe; *c*, chalaza.
FIG. 273. Anatropous ovule of a Violet: the parts lettered as in the last.

ovules; Fig. 274, an orthotropous, Fig. 275, an anatropous ovule. The letters correspond in the two; *c*, the chalaza; *f*, the orifice; *r*, rhaphe (of which there is of course none in Fig. 274); *p*, the outer coat, called *primine; s*, inner coat, called *secundine; n*, nucleus or kernel.



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LESSON XIX.

MORPHOLOGY OF THE RECEPTACLE.

327. The Receptacle (also called the *Torus*) is the axis, or stem, which the leaves and other parts of the blossom are attached to (231). It is commonly small and short (as in Fig. 169); but it sometimes occurs in more conspicuous and remarkable forms.

328. Occasionally it is elongated, as in some plants of the Caper family (Fig. 276), making the flower really look like a branch, having its circles of leaves, stamens, &c., separated by long spaces or internodes.

329. The Wild Geranium or Cranesbill has the receptacle prolonged above and between the insertion of the pistils, in the form of a slender beak. In the blossom, and until the fruit is ripe, it is concealed by the five pistils united around it, and their flat styles covering its whole surface (Fig. 277). But at maturity, the five small and one-seeded fruits separate, and so do their styles, from the beak, and hang suspended from the summit. They split off elasti

cally from the receptacle, curving upwards with a sudden jerk, which scatters the seed, often throwing it to a considerable distance.

330. When a flower bears a great many pistils, its receptacle is generally enlarged so as to give them room; sometimes becoming broad and flat, as in the Flowering Raspberry, sometimes elongated, as in the Blackberry, the Magnolia, &c. It is the receptacle in the Strawberry (Fig. 279), much enlarged and pulpy when ripe, which forms the eatable part of the fruit, and bears the small seed-like pistils on its surface. In the Rose (Fig. 280), instead of being convex or conical, the receptacle is deeply concave, or urn-shaped. Indeed, a Rose-hip may be likened to a strawberry turned inside out, like the finger of a glove reversed, and the whole covered by the adherent tube of the calyx, which remains beneath in the strawberry.

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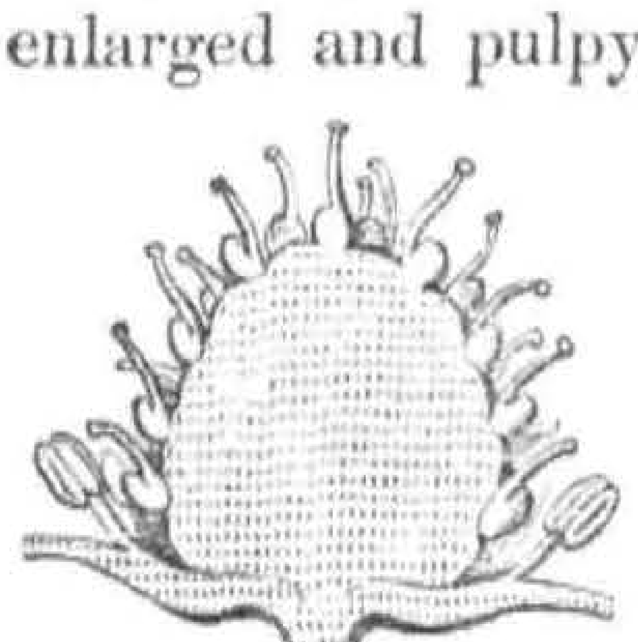
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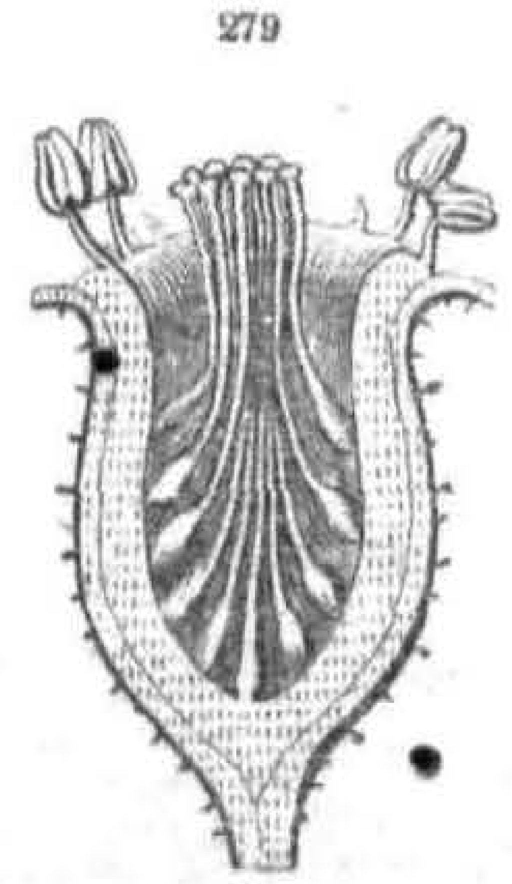
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331. **A Disk** is a part of the receptacle, or a growth from it, enlarged under or around the pistil. It is *hypogynous* (269), when free from all union either with the pistil or the calyx, as in the Rue and the Orange (Fig. 281). It is *perigynous* (270), when it adheres to the base of the calyx, as in the Bladder-nut and Buckthorn (Fig. 282,

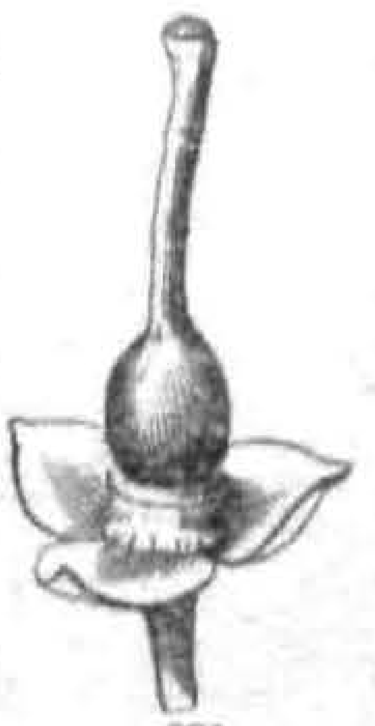
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FIG. 276. Flower of Gynandropsis, the receptacle enlarged and flattened where it bears the sepals and petals, then elongated into a slender stalk, bearing the stamens (in appearance, but they are monadelphous) above its middle, and a compound ovary on its summit.

FIG. 277. Young fruit of the common Wild Cranesbill.

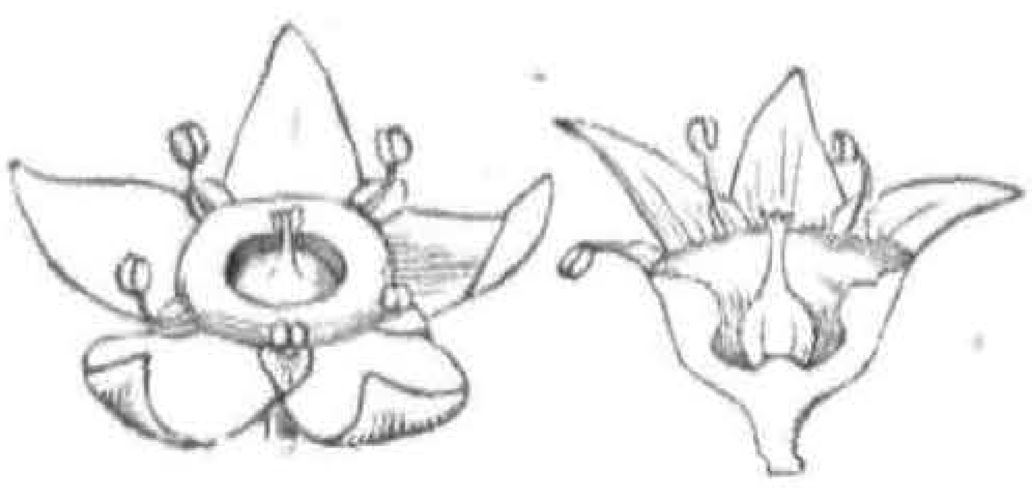
FIG. 278. The same, ripe, with the five pistils splitting away from the long beak or receptacle, and hanging from its top by their styles.

FIG. 279. Longitudinal section of a young strawberry, enlarged.

FIG. 280. Similar section of a young Rose-hip

FIG. 281. Pistil of the Orange, with a large hypogynous disk at its base.

283). Often it adheres both to the calyx and to the ovary, as in New Jersey Tea, the Apple, &c., consolidating the whole together In such cases it is sometimes carried up and expanded on the top of the ovary, as in the Parsley and the Ginseng families, when it is said to be *epigynous* (273).



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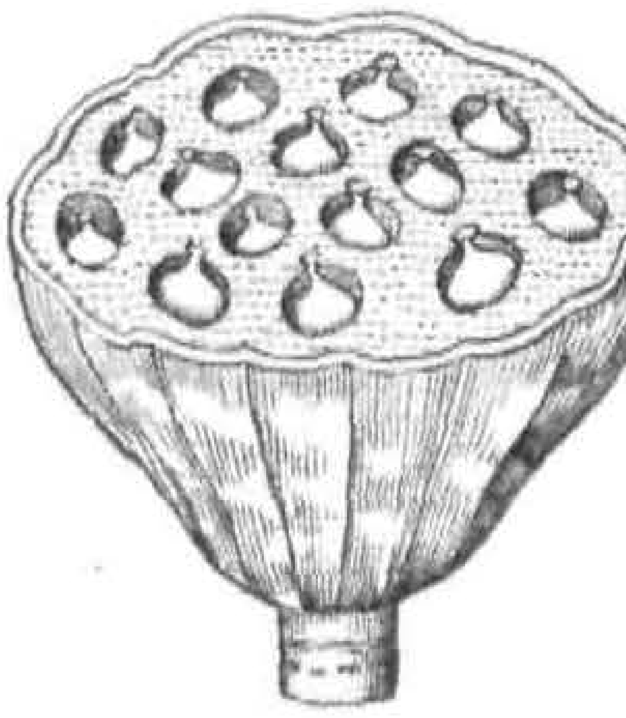
332. In Nelumbium, — a large Water-Lily, abounding in the waters of our Western States, — the singular and greatly enlarged receptacle is shaped like a top, and bears the small pistils immersed in separate cavities of its flat upper surface (Fig. 284).



284

LESSON XX.

THE FRUIT.

333 The ripened ovary, with its contents, becomes the *Fruit*. When the tube of the calyx adheres to the ovary, it also becomes a part of the fruit: sometimes it even forms the principal bulk of it, as in the apple and pear.

334. Some fruits, as they are commonly called, are not fruits at all in the strict botanical sense. A strawberry, for example (as we have just seen, 330, Fig. 282), although one of the choicest *fruits* in the common acceptation, is only an enlarged and pulpy receptacle, bearing the real fruits (that is, the ripened pistils) scattered over its

FIG. 282. Flower of a Buckthorn, with a large perigynous disk. 283. The same, divided.
FIG. 284. Receptacle of Nelumbium, in fruit.

surface, and too small to be much noticed. And mulberries, figs, and pine-apples are masses of many fruits with a pulpy flower-stalk, &c. Passing these by for the present, let us now consider only

335. **Simple Fruits.** These are such as are formed by the ripening of a single pistil, whether simple (305) or compound (311).

336. A simple fruit consists, then, of the *Seed-vessel* (technically called the *Pericarp*), or the walls of the ovary matured, and the seeds, contained in it. Its structure is generally the same as that of the ovary, but not always; because certain changes may take place after flowering. The commonest change is the obliteration in the growing fruit of some parts which existed in the pistil at the time of flowering. The ovary of a Horsechestnut, for instance, has three cells and two ovules in each cell; but the fruit never has more than three seeds, and rarely more than one or two, and only as many cells. Yet the vestiges of the seeds that have not matured, and of the wanting cells of the pod, may always be detected in the ripe fruit. This obliteration is more complete in the Oak and Chestnut. The ovary of the first likewise has three cells, that of the second six or seven cells, each with two ovules hanging from the summit. We might therefore expect the acorn and the chestnut to have as many cells, and two seeds in each cell. Whereas, in fact, all the cells and all the ovules but one are uniformly obliterated in the forming fruit, which thus becomes one-celled and one-seeded, and rarely can any vestige be found of the missing parts.

337. On the other hand, a one-celled ovary sometimes becomes several-celled in the fruit by the formation of false partitions, commonly by cross-partitions, as in the jointed pod of the Sea-Rocket and the Tick-Trefoil (Fig. 304).

338. **Their Kinds.** In defining the principal kinds of simple fruits which have particular names, we may classify them, in the first place, into,—1. *Fleshy Fruits*; 2. *Stone Fruits*; and 3. *Dry Fruits*. The first and second are of course *indehiscent*; that is, they do not split open when ripe to discharge the seeds.

339. In *fleshy fruits* the whole pericarp, or wall of the ovary, thickens and becomes soft (fleshy, juicy, or pulpy) as it ripens. Of this the leading kind is

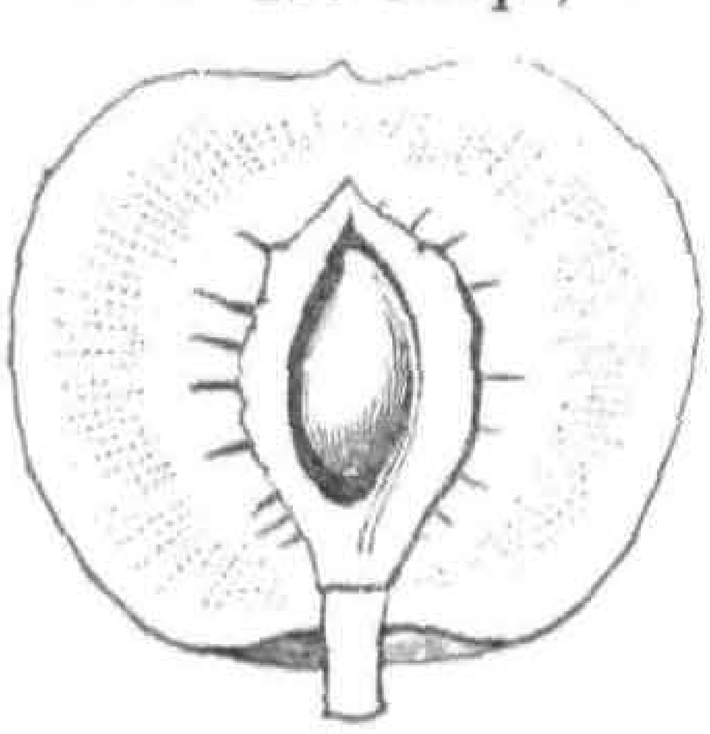
340. **The Berry,** such as the gooseberry and currant, the blueberry and cranberry, the tomato, and the grape. Here the whole flesh is equally soft throughout. The orange is merely a berry with a leathery rind.

341. **The Pepo**, or *Gourd-fruit*, is the sort of berry which belongs to the Gourd family, mostly with a hard rind and the inner portion softer. The pumpkin, squash, cucumber, and mélon are the principal examples.

342. **The Pome** is a name applied to the apple, pear, and quince; fleshy fruits like a berry, but the principal thickness is calyx, only the papery pods arranged like a star in the core really belonging to the pistil itself (333).

343. Secondly, as to fruits which are partly fleshy and partly hard, one of the most familiar kinds is

344. **The Drupe**, or *Stone-fruit;* of which the cherry, plum, and peach (Fig. 285) are familiar examples. In this the outer part of the thickness of the pericarp becomes fleshy, or softens, like a berry, while the inner hardens, like a nut. From the way in which the pistil is constructed (305), it is evident that the fleshy part here answers to the lower, and the stone to the upper, side of the leaf;—a leaf always consisting of two layers of green pulp, an upper and an under layer, which are considerably different (439).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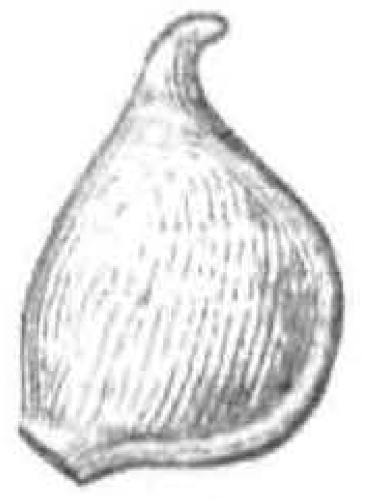
345. Whenever the walls of a fruit are separable into two layers, the outer layer is called the *Exocarp*, the inner, the *Endocarp* (from Greek words meaning "outside fruit" and "inside fruit"). But in a drupe the outer portion, being fleshy, is likewise called *Sarcocarp* (which means "fleshy fruit"), and the inner, the *Putamen* or stone. The stone of a peach, and the like, it will be perceived, belongs to the fruit, not to the seed. When the walls are separable into three layers, the outer layer is named either exocarp or *Epicarp;* the middle one is called the *Mesocarp* (i. e. middle fruit); and the innermost, as before, the *Endocarp*.

346. Thirdly, in *dry fruits* the seed-vessel remains herbaceous in texture, or becomes thin and membranaceous, or else it hardens throughout. Some forms remain closed, that is, are *indehiscent* (338); others are *dehiscent*, that is, split open at maturity in some regular way. Of indehiscent or closed dry fruits the principal kinds are the following.

347. **The Achenium**, or *Akene*, is a small, one-seeded, dry, indehis-

FIG. 285. Longitudinal section of a peach, showing the flesh, the stone, and the seed.

cent fruit, such as is popularly taken for a naked seed: but it is plainly a ripened ovary, and shows the remains of its style or stigma, or the place from which it has fallen. Of this sort are the fruits of the Buttercup (Fig. 286, 287), the Cinque-foil, and the Strawberry (Fig. 279, 288); that is, the real fruits, botanically speaking, of the latter, which are taken for seeds, not the large juicy receptacle on the surface of which they rest (330). Here the akenes are simple pistils (305), very numerous in the same flower, and forming a head of such fruits. In the Nettle, Hemp, &c., there is only one pistil to each blossom.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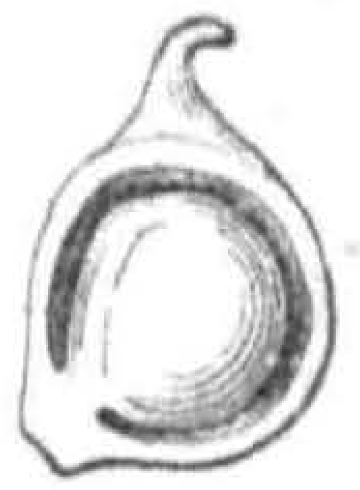
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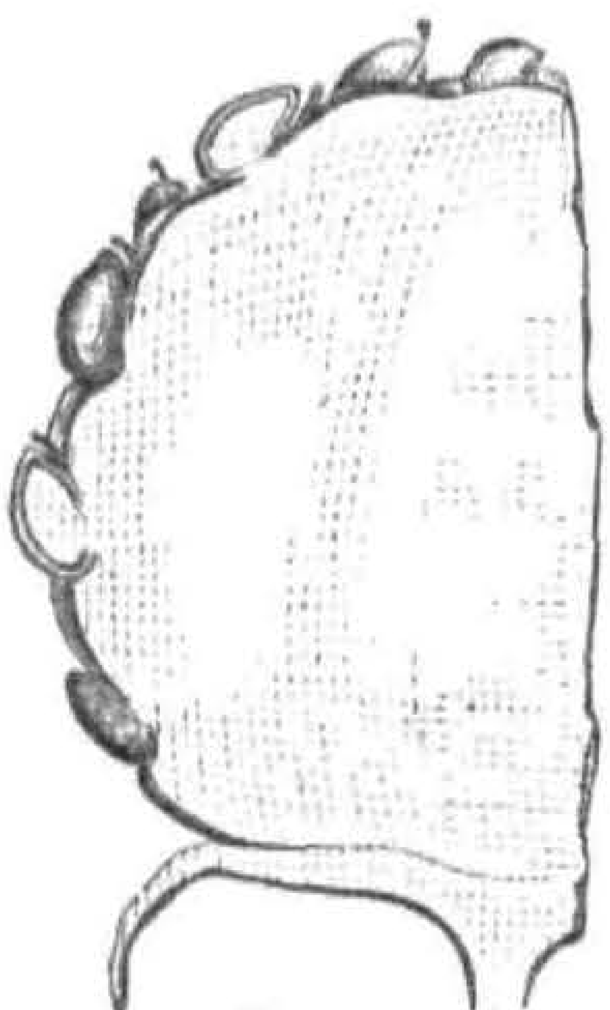

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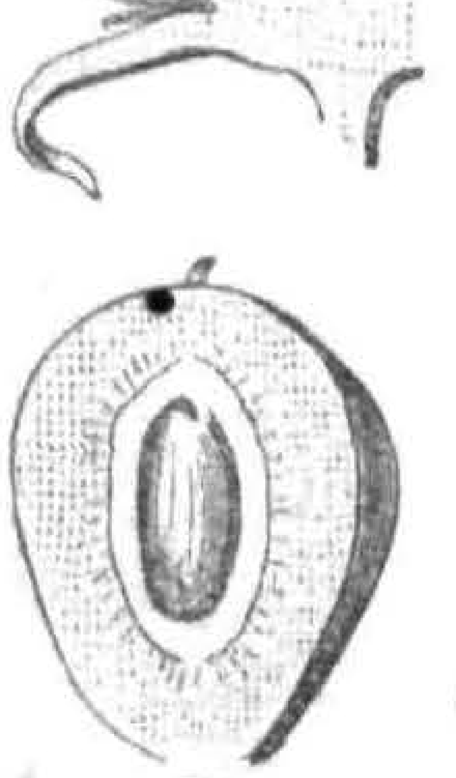
348. In the raspberry and blackberry, each grain is a similar pistil, like that of the strawberry in the flower, but ripening into a miniature stone-fruit, or drupe. So that in the strawberry we eat the receptacle, or end of the flower-stalk; in the raspberry, a cluster of stone-fruits, like cherries on a very small scale; and in the blackberry, both a juicy receptacle and a cluster of stone-fruits covering it (Fig. 289, 290).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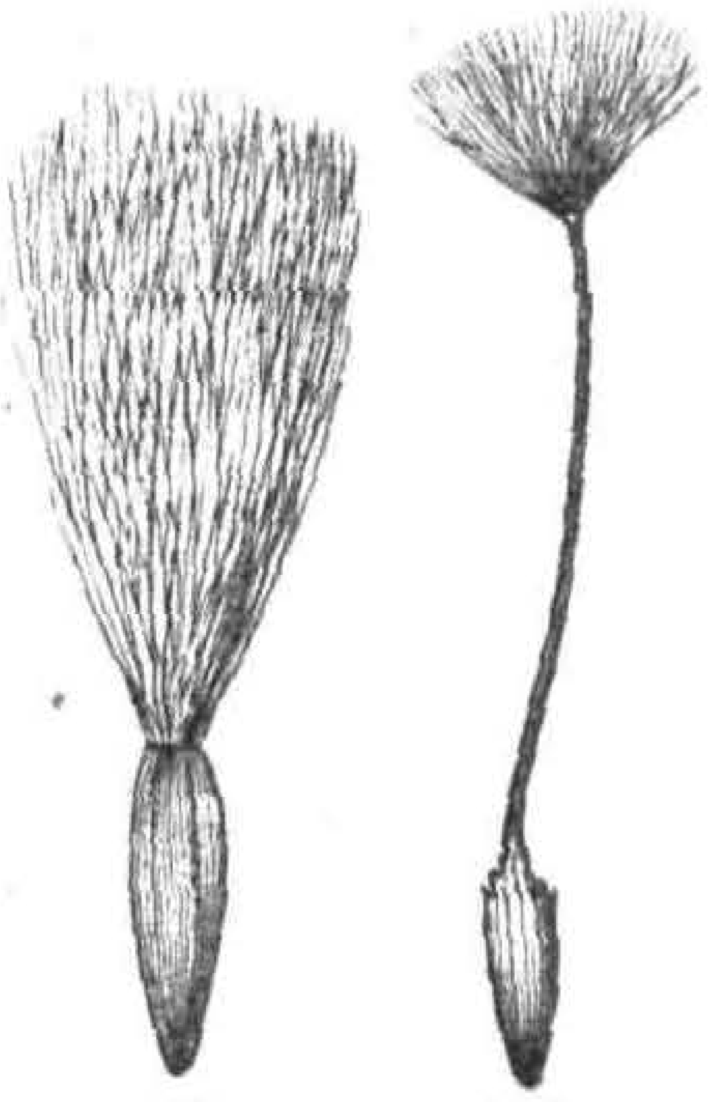
349. The fruit of the Composite family is also an achenium. Here the surface of the ovary is covered by an adherent calyx-tube, as is evident from the position of the corolla, apparently standing on its summit (321, and Fig. 220, *a*). Sometimes the limb or divisions of the calyx are entirely wanting, as in Mayweed (Fig. 291) and Whiteweed. Sometimes the limb of the calyx forms a *crown* or cup on the top of the achenium, as in Succory (Fig. 292); in Coreopsis, it often takes the form of two blunt teeth or scales; in the Sunflower (Fig. 293), it consists of two

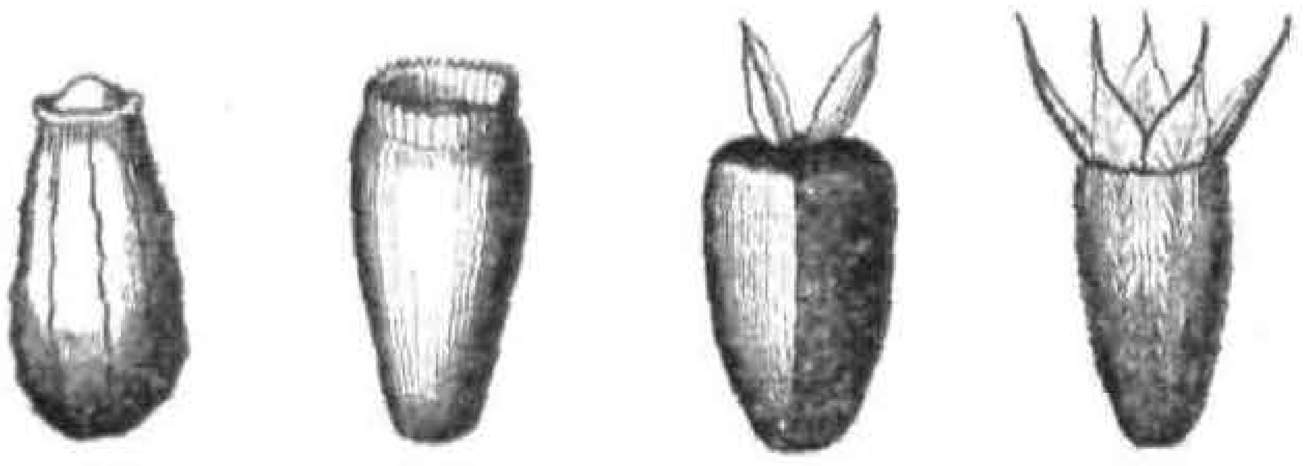
FIG. 286. Achenium of Buttercup. 287. Same, cut through, to show the seed within.

FIG. 288. Slice of a part of a ripe strawberry, enlarged; some of the achenia shown cut through.

FIG. 289. Slice of a part of a blackberry. 290 One of the grains or drupes divided, more enlarged; showing the flesh, the stone, and the seed, as in Fig. 285.

thin scales which fall off at the touch; in the Sneezeweed, of about five very thin scales, which look more like a calyx (Fig. 294); and in the Thistle, Aster, Sow-Thistle (Fig. 295), and hundreds of others, it is cut up into a tuft of fine bristles or hairs. This is called the *Pappus*; — a name which properly means the down like that of the Thistle; but it is applied to all these forms, and to every other under which the limb of the calyx of the "compound flowers" appears. In Lettuce, Dandelion (Fig. 296), and the like, the achenium as it matures tapers upwards into a slender beak, like a stalk to the pappus.





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350. **A Utricle** is the same as an achenium, but with a thin and bladdery loose pericarp; like that of the Goosefoot or Pigweed (Fig. 297). When ripe it bursts open irregularly to discharge the seed; or sometimes it opens by a circular line all round, the upper part falling off like a lid; as in the Amaranth (Fig. 298).

297

351. **A Caryopsis, or Grain,** differs from the last only in the seed adhering to the thin pericarp throughout, so that fruit and seed are incorporated into one body; as in wheat, Indian corn, and other kinds of grain.

298

352. **A Nut** is a dry and indehiscent fruit, ommonly one-celled and one-seeded, with a hard, crustaceous, or bony wall, such as the cocoanut, hazelnut, hestnut, and the acorn (Fig. 21, 299). Here the nvolucre, in the form of a cup at the base, is called the *Cupule*. In he Chestnut it forms the bur; in the Hazel, a leafy husk.

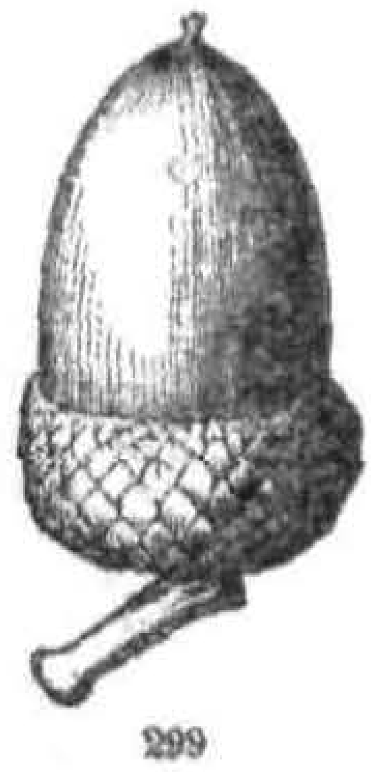

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FIG. 291. Achenium of Mayweed (no pappus). 292. That of Succory (its pappus a shallow cup). 293. Of Sunflower (pappus of two deciduous scales). 294. Of Sneezeweed (Helenium), with its pappus of five scales. 295. Of Sow-Thistle, with its pappus of delicate downy hairs. 296. Of the Dandelion, its pappus raised on a long beak.

FIG. 297. Utricle of the common Pigweed (Chenopodium album).

FIG. 298. Utricle (pyxis) of Amaranth, opening all round (circumcissile).

FIG. 299. Nut (acorn) of the Oak, with its cup (or cupule).

353. **A Samara, or Key-fruit,** is either a nut or an achenium, or any other indehiscent fruit, furnished with a wing, like that of the Maple (Fig. 1), Ash (Fig. 300), and Elm (Fig. 301).

354. **The Capsule, or Pod,** is the general name for dry seed-vessels which split or burst open at maturity. But several sorts of pod are distinguished by particular names. Two of them belong to simple pistils, namely, the *Follicle* and the *Legume*.

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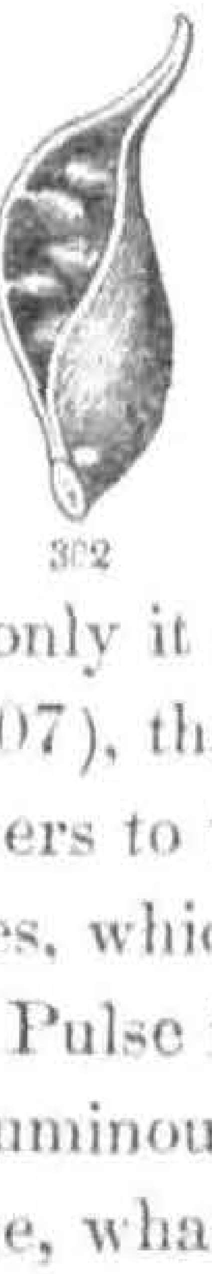
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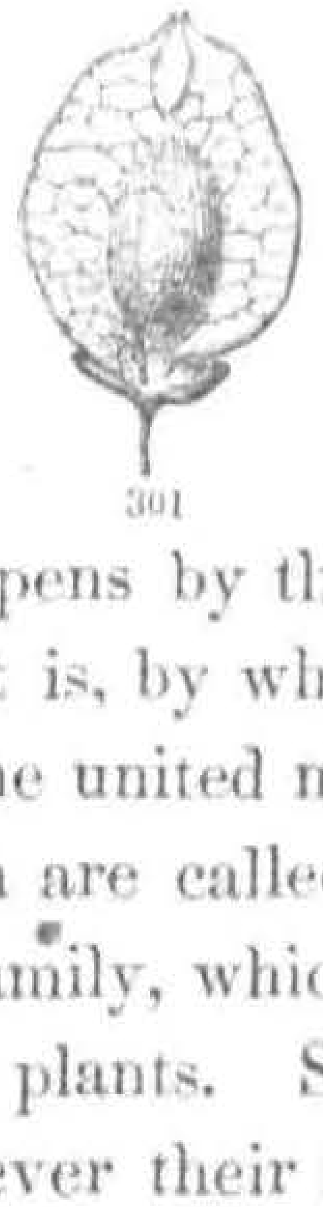
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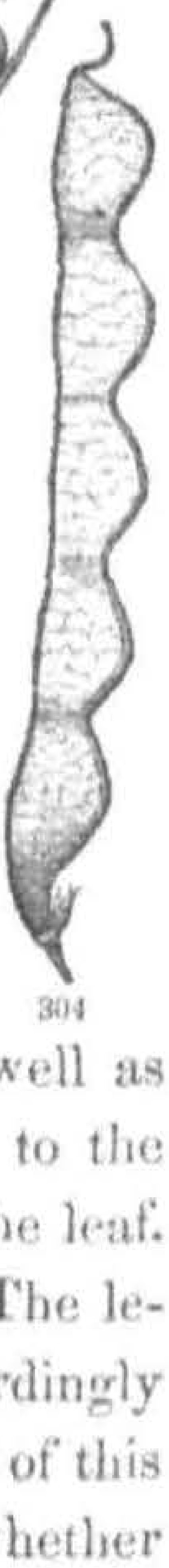
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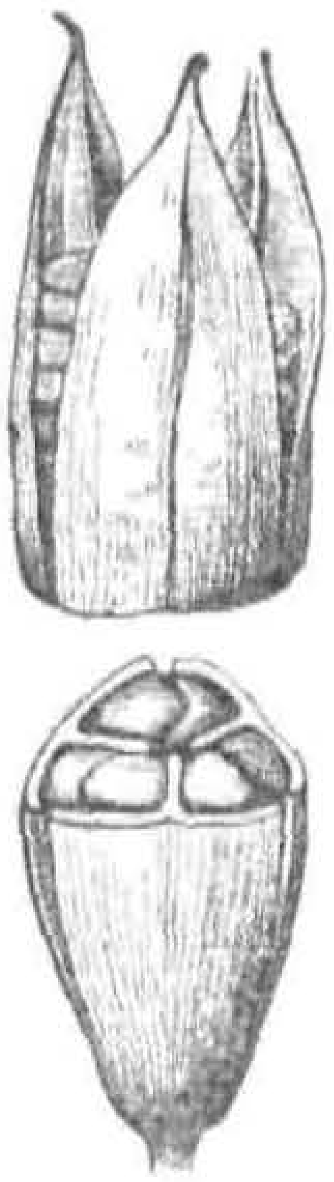
355. **The Follicle** is a fruit of a simple pistil opening along the inner suture (307). The pods of the Pæony, Columbine, Larkspur, Marsh-Marigold (Fig. 302), and Milkweed are of this kind. The seam along which the follicle opens answers to the edges of the pistil-leaf (Fig. 251, 253).

356. **The Legume** or true *Pod*, like the Pea-pod (Fig. 303), is similar to the follicle, only it opens by the outer as well as the inner or ventral suture (307), that is, by what answers to the midrib as well as by what answers to the united margins of the leaf. It splits therefore into two pieces, which are called *valves*. The legume belongs to plants of the Pulse family, which are accordingly termed *Leguminosæ*, that is, leguminous plants. So the fruits of this family keep the name of legume, whatever their form, and whether they open or not. A legume divided across into one-seeded joints, which separate when ripe, as in Tick-Trefoil (Fig. 304), is named a *Loment*.

357. **The true Capsule** is the pod of a compound pistil. Like the ovary it resulted from, it may be one-celled, or it may have as many cells as there are carpels in its composition. It may discharge its seeds through chinks or pores, as in the Poppy, or burst irregularly in some part, as in Lobelia and the Snapdragon; but commonly it splits open (or is *dehiscent*) lengthwise into regular pieces, called *valves*.

FIG. 300. Samara or key of the White Ash. 301. Samara of the American Elm.
FIG. 302. Follicle of Marsh-Marigold (Caltha palustris).
FIG. 303. Legume of a Sweet Pea, opened.
FIG. 304. Loment or jointed legume of Tick-Trefoil (Desmodium).

358. *Dehiscence* of a pod resulting from a compound pistil, when regular, takes place in one of two principal ways, which are best shown in pods of two or three cells. Either the pod splits open down the middle of the back of each cell, when the dehiscence is *loculicidal*, as in Fig. 305; or it splits through the partitions, after which each cell generally opens at its inner angle, when it is *septicidal*, as in Fig. 306. These names are of Latin derivation, the first meaning "cutting into the cells"; the second, "cutting through the partitions." Of the first sort, the Lily and Iris (Fig. 305) are good examples; of the second, the Rhododendron, Azalea, and St. John's-wort. From the structure of the pistil (305–311) the student will readily see, that the line down the back of each cell answers to the dorsal suture of the carpel; so that the pod opens by this when loculicidal, while it separates into its component carpels, which open as follicles, when septicidal. Some pods open both ways, and so split into twice as many valves as the carpels of which they are formed.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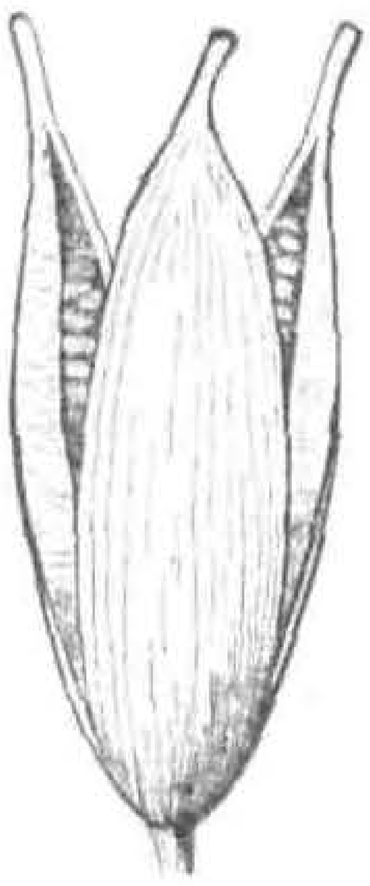
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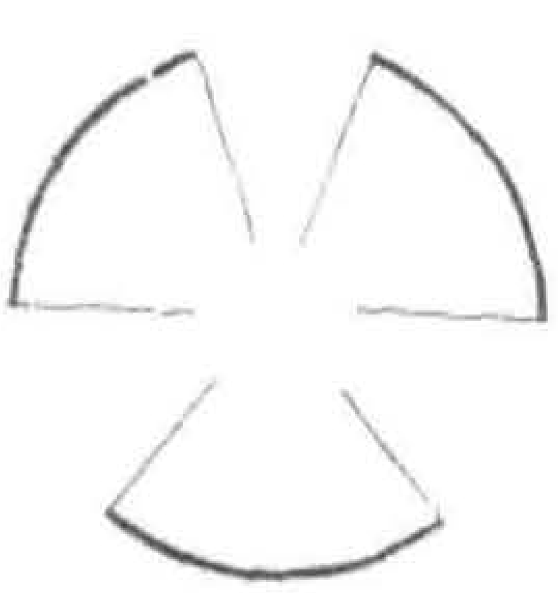
359. In loculicidal dehiscence the valves naturally bear the partitions on their middle; in the septicidal, half the thickness of a partition is borne on the margin of each valve. See the diagrams, Fig. 307–309. A variation of either mode sometimes occurs, as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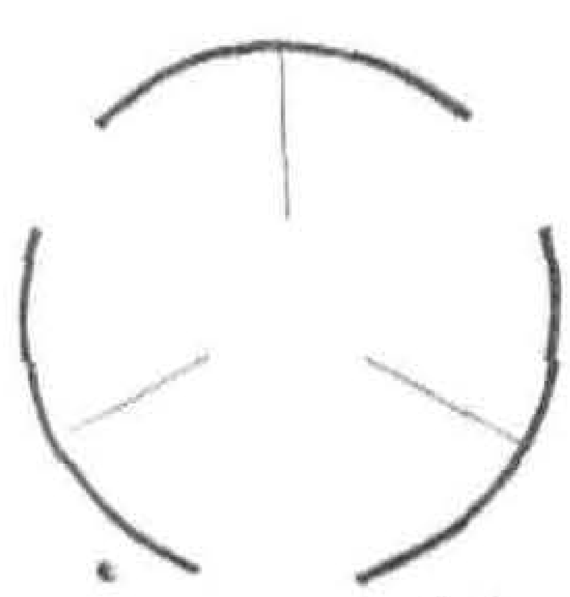
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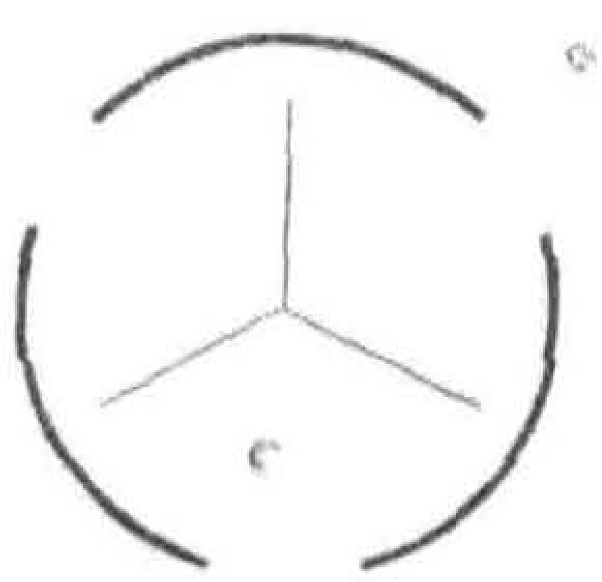
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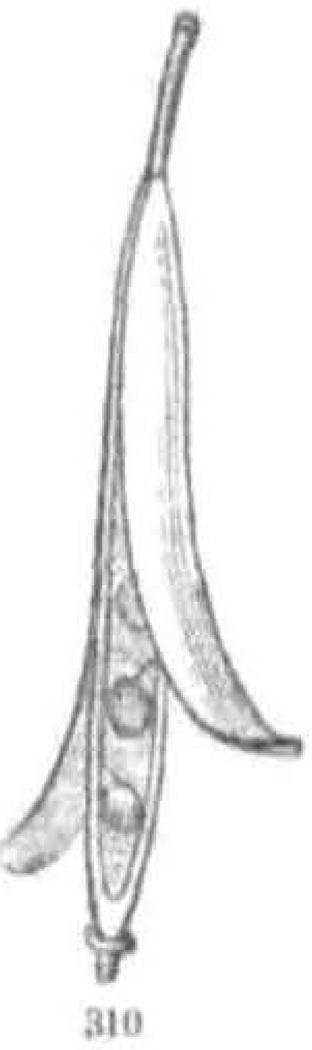
shown in the diagram, Fig. 309, where the valves break away from the partitions. This is called *septifragal* dehiscence; and may be seen in the Morning-Glory.

360. Three remaining sorts of pods are distinguished by proper names, viz.: —

FIG. 305. Capsule of Iris (with loculicidal dehiscence), below cut across.
FIG. 306. Pod of a Marsh St. John's-wort, with septicidal dehiscence.
FIG. 307. Diagram of septicidal; 308, of loculicidal; and 309, of septifragal dehiscence.

361. **The Silique** (Fig. 310), the peculiar pod of the Mustard family; which is two-celled by a false partition stretched across between two parietal placentæ. It generally opens by two valves from below upwards, and the placentæ with the partition are left behind when the valves fall off.



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362. **A Silicle or Pouch** is only a short and broad silique, like that of the Shepherd's Purse, of the Candy-tuft, &c.

363. **The Pyxis** is a pod which opens by a circular horizontal line, the upper part forming a lid, as in Purslane (Fig. 311), the Plantain, Henbane, &c. In these the dehiscence extends all round, or is *circumcissile*. So it does in Fig. 298, which represents a sort of one-seeded pyxis. In Jeffersonia or Twin-leaf, the line does not separate quite round, but leaves a portion to form a hinge to the lid.

311

364. **Multiple or Collective Fruits** (334) are, properly speaking, masses of fruits, resulting from several or many blossoms, aggregated into one body. The pine-apple, mulberry, Osage-orange, and the fig, are fruits of this kind. This latter is a peculiar form, however, being to a mulberry nearly what a Rose-hip is to a strawberry (Fig. 279, 280), namely, with a hollow receptacle bearing the flowers concealed inside; and the whole eatable part is this pulpy common *receptacle, or hollow thickened flower-stalk.*

365. **A Strobile, or Cone** (Fig. 314), is the peculiar multiple fruit of Pines, Cypresses, and the like; hence named *Coniferæ*, viz. cone-bearing plants. As already shown (322), these cones are made of *open pistils*, mostly in the form of flat scales, regularly overlying each other, and pressed together in a spike or head. Each scale bears one or two naked seeds on its inner face. When the cone is ripe and dry, the scales turn back or diverge, and the seed peels off and falls, generally carrying with it a wing, which was a part of the lining of the scale, and which facilitates the dispersion of the seeds by the wind (Fig. 312, 313). In Arbor-Vitæ, the scales

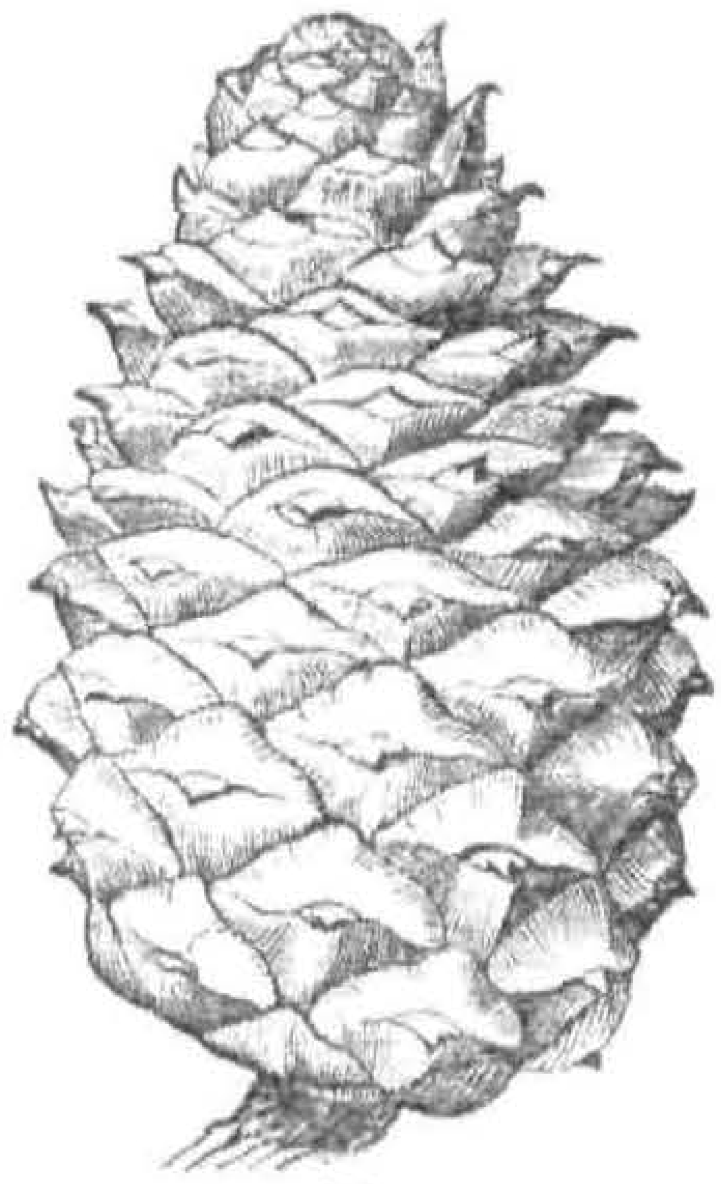
312 313

FIG. 310. Silique of Spring Cress (Cardamine rhomboidea), opening.

FIG. 311. The pyxis, or pod, of the common Purslane

FIG. 312. Inside view of a scale from the cone of Pitch-Pine; with one of the seeds (Fig. 313) detached; the other in its place on the scale.

of the small cone are few, and not very unlike the leaves (Fig. 265). In Cypress they are very thick at the top and narrow at the base, so as to make a peculiar sort of closed cone. In Juniper and Red Cedar, the few scales of the very small cone become fleshy, and ripen into a fruit which might be taken for a berry.



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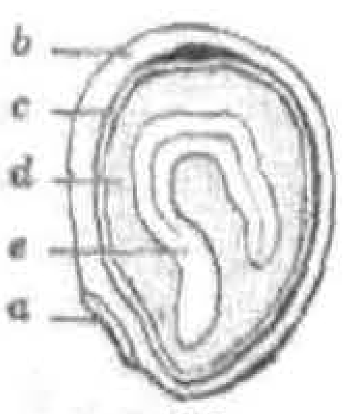
LESSON XXI.

THE SEED.

366. The ovules (323), when they have an embryo (or undeveloped plantlet, 16) formed in them, become seeds.

367. The *Seed*, like the ovule from which it originates, consists of its coats, or integuments, and a kernel.

368. **The Seed-coats** are commonly two (324), the outer and the inner. Fig. 315 shows the two, in a seed cut through lengthwise. The outer coat is often hard or crustaceous, whence it is called the *Testa*, or shell of the seed; the inner is thin and delicate.



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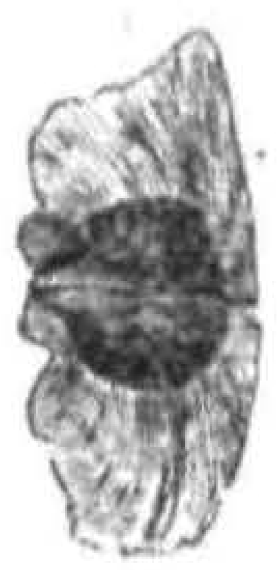
369. The shape and the markings, so various in different seeds, depend mostly on the outer coat. Sometimes it fits

FIG. 314. Cone of Pitch-Pine (Pinus rigida).

FIG. 315. Seed of Basswood cut through lengthwise: *a*, the hilum or scar; *b*, the outer coat; *c*, the inner; *d*, the albumen; *e*, the embryo.

the kernel closely; sometimes it is expanded into a *wing*, as in the Trumpet-Creeper (Fig. 316), and occasionally this wing is cut up into shreds or tufts, as in the Catalpa; or instead of a wing it may bear a *coma*, or tuft of long and soft hairs, such as we find in the Milkweed or Silkweed (Fig. 317). The object of wings or downy tufts is to render the seeds buoyant, so that they may be widely dispersed by the winds. This is clear, not only from their evident adaptation to this purpose, but also from the interesting fact that winged and tufted seeds are found only in fruits that split open at maturity, never in those that remain closed. The coat of some seeds is beset with long hairs or wool. *Cotton*, one of the most important vegetable products, — since it forms the principal clothing of the larger part of the human race, — consists of the long and woolly hairs which thickly cover the whole surface of the seed. Certain seeds have an additional, but more or less incomplete covering, outside of the real seed-coats, called an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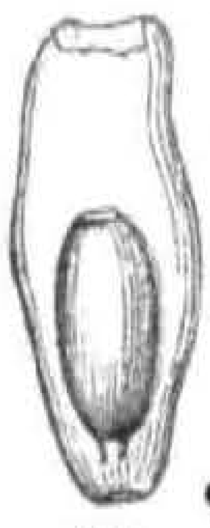
370. **Aril, or Arillus.** The loose and transparent bag which encloses the seed of the White Water-Lily (Fig. 318) is of this kind. So is the *mace* of the nutmeg; and also the scarlet pulp around the seeds of the Waxwork (Celastrus) and Strawberry-bush (Euonymus), so ornamental in autumn, after the pods burst. The aril is a growth from the extremity of the seed-stalk, or the placenta.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371. The names of the parts of the seed and of its kinds are the same as in the ovule. The scar left where the seed-stalk separates is called the *Hilum*. The orifice of the ovule, now closed up, and showing only a small point or mark, is named the *Micropyle*. The terms *orthotropous*, *anatropous*, &c.

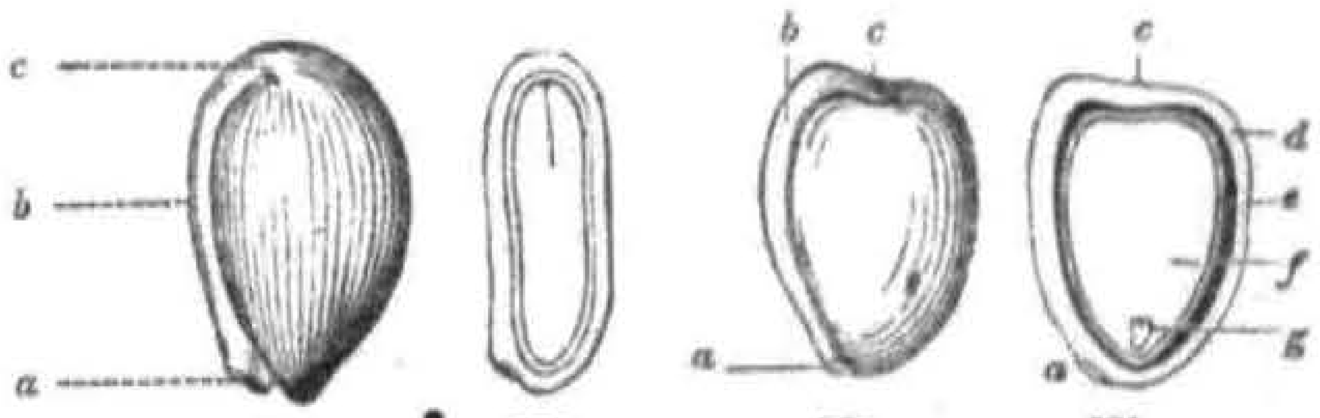

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FIG. 316. A winged seed of the Trumpet-Creeper.
FIG. 317. Seed of Milkweed, with a *coma* or tuft of long silky hairs at one end.
FIG. 318. Seed of White Water-Lily, enclosed in its aril.
FIG. 319. Seed of a Violet (anatropous): *a*, hilum; *b*, rhaphe; *c*, chalaza.
FIG. 320. Seed of a Larkspur (also anatropous); the parts lettered as in the last.
FIG. 321. The same, cut through lengthwise: *a*, the hilum; *c*, chalaza; *d*, outer seed-coat; *e*, inner seed-coat; *f*, the albumen; *g*, the minute embryo.
FIG. 322. Seed of a St. John's-wort, divided lengthwise; here the whole kernel is embryo.

apply to seeds just as they do to ovules (325); and so do those terms which express the direction of the ovule or the seed in the cell; such as *erect, ascending, horizontal, pendulous,* or *suspended* (323): therefore it is not necessary to explain them anew. The accompanying figures (Fig. 319 – 322) show all the parts of the most common kind of seed, namely, the anatropous.

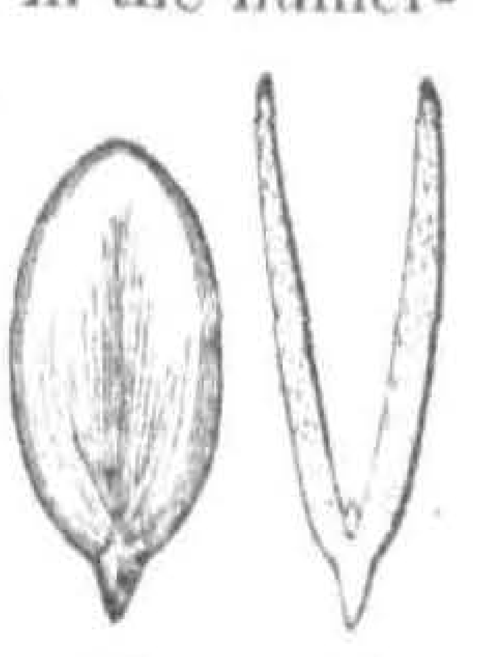
372. **The Kernel, or Nucleus,** is the whole body of the seed within the coats. In many seeds the kernel is all *Embryo;* in others a large part of it is the *Albumen.*

373. **The Albumen** of the seed is an accumulation of nourishing matter (starch, &c.), commonly surrounding the embryo, and destined to nourish it when it begins to grow, as was explained in the earlier Lessons (30 – 32). It is the floury part of wheat, corn (Fig. 38, 39), buckwheat, and the like. But it is not always *mealy* in texture. In Poppy-seeds it is *oily.* In the seeds of Pæony and Barberry, and in the cocoanut, it is *fleshy;* in coffee it is *corneous* (that is, hard and tough, like horn); in the Ivory Palm it has the hardness as well as the general appearance of ivory, and is now largely used as a substitute for it in the fabrication of small objects. However solid its texture, the albumen always softens and partly liquefies during germination; when a considerable portion of it is transformed into sugar, or into other forms of fluid nourishment, on which the growing embryo may feed.

374. **The Embryo,** or *Germ,* is the part to which all the rest of the seed, and also the fruit and the flower, are subservient. When the embryo is small and its parts little developed, the albumen is the more abundant, and makes up the principal bulk of the seed, as in Fig. 30, 321, 325. On the other hand, in many seeds there is no albumen at all; but the strong embryo forms the whole kernel; as in the Maple (Fig. 2, 3), Pumpkin (Fig. 9), Almond, Plum, and Apple (Fig. 11, 12), Beech (Fig. 13), and the like. Then, whatever nourishment is needed to establish the plantlet in the soil is stored up in the body of the embryo itself, mostly in its seed-leaves. And these accordingly often become very large and thick, as in the almond, bean, and pea (Fig. 16, 19), acorn (Fig. 21), chestnut, and horsechestnut (Fig. 23, 24). Besides these, Fig. 25, 26, 30 to 37, 43, and 45 exhibit various common forms of the embryo; and also some of the ways in which it is placed in the albumen; being sometimes straight, and sometimes variously coiled up or packed away.

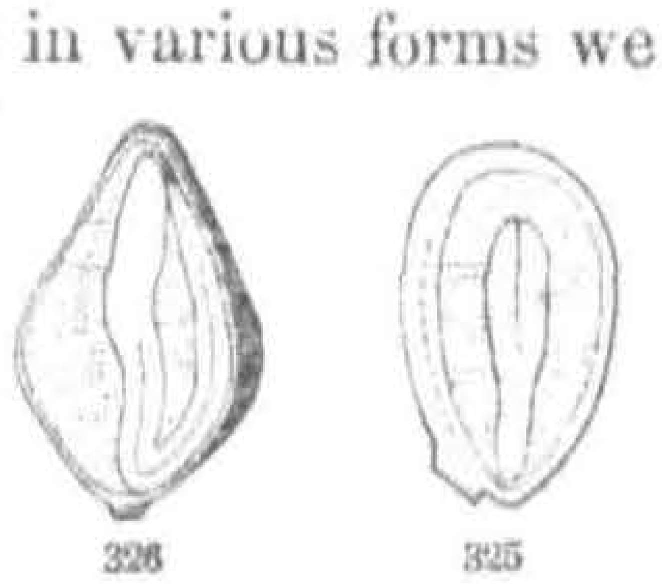
375. The embryo, being a rudimentary plantlet, ready formed in the seed, has only to grow and develop its parts to become a young plant (15). Even in the seed these parts are generally distinguishable, and are sometimes very conspicuous; as in a Pumpkin-seed, for example (Fig. 323, 324). They are, first,

376. **The Radicle,** or rudimentary stemlet, which is sometimes long and slender, and sometimes very short, as we may see in the numerous figures already referred to. In the seed it always points to the micropyle (371), or what answers to the foramen of the ovule (Fig. 325, 326). As to its position in the fruit, it is said to be *inferior* when it points to the base of the pericarp, *superior* when it points to its summit, &c. The base or free end of the radicle gives rise to the root; the other extremity bears



323 324

377. **The Cotyledons or Seed-Leaves.** With these in various forms we have already become familiar. The number of cotyledons has also been explained to be important (32, 33). In Corn (Fig. 40), and in all Grasses, Lilies, and the like, we have a



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Monocotyledonous embryo, namely, one furnished with only a single cotyledon or seed-leaf. — Nearly all the rest of our illustrations exhibit various forms of the

Dicotyledonous embryo; namely, with a pair of cotyledons or seed-leaves, always opposite each other. In the Pine family we find a

Polycotyledonous embryo (Fig. 45, 46); that is, one with several, or more than two, seed-leaves, arranged in a circle or whorl.

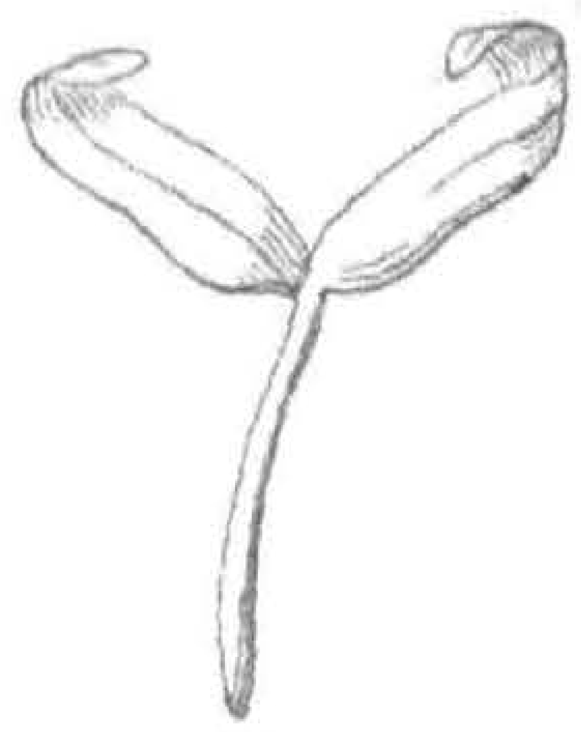
378. **The Plumule** is the little bud, or rudiment of the next leaf or pair of leaves after the seed-leaves. It appears at the summit of the radicle, between the cotyledons when there is a pair of them, as in Fig. 324, 14, 24, &c.; or the cotyledon when only one is wrapped round it, as in Indian Corn, Fig. 40. In germination the plumule develops upward, to form the ascending trunk or stem of the plant, while the other end of the radicle grows downward, and becomes the root.

FIG. 323. Embryo of the Pumpkin, seen flatwise. 324. Same cut through and viewed edgewise, enlarged; the small plumule seen between the cotyledons at their base.

FIG. 325. Seed of a Violet (Fig. 319) cut through, showing the embryo in the section, edgewise; being an *anatropous* seed, the radicle of the straight embryo points down to the base near the hilum.

FIG. 326. Similar section of the *orthotropous* seed of Buckwheat. Here the radicle points directly away from the hilum, and to the apex of the seed; also the thin cotyledons happen in this plant to be bent round into the same direction.

379. This completes the circle, and brings our vegetable history round to its starting-point in the Second Lesson; namely, The Growth of the Plant from the Seed.



327

LESSON XXII.

HOW PLANTS GROW.

380. A PLANT grows from the seed, and from a tiny embryo, like that of the Maple (Fig. 327), becomes perhaps a large tree, producing every year a crop of seeds, to grow in their turn in the same way. But *how* does the plant grow? A little seedling, weighing only two or three grains, often doubles its weight every week of its early growth, and in time may develop into a huge bulk, of many tons' weight of vegetable matter. How is this done? What is vegetable matter? Where did it all come from? And by what means is it increased and accumulated in plants? Such questions as these will now naturally arise in any inquiring mind; and we must try to answer them.

381. **Growth** *is the increase of a living thing in size and substance.* It appears so natural to us that plants and animals should grow, that people rarely think of it as requiring any explanation. They say that a thing is so because it grew so. Still we wish to know how the growth takes place.

382. Now, in the foregoing Lessons we explained the whole structure of the plant, with all its organs, by beginning with the seedling plantlet, and following it onward in its development through the

FIG. 327. Germinating embryo of a Maple.

whole course of vegetation (12, &c.). So, in attempting to learn how this growth took place, it will be best to adopt the same plan, and to commence with the commencement, that is, with the first formation of a plant. This may seem not so easy, because we have to begin with parts too small to be seen without a good microscope, and requiring much skill to dissect and exhibit. But it is by no means difficult to describe them; and with the aid of a few figures we may hope to make the whole matter clear.

383. The embryo in the ripe seed is already a plant in miniature, as we have learned in the Second, Third, and Twenty-first Lessons. It is already provided with stem and leaves. To learn how the plant began, therefore, we must go back to an earlier period still; namely, to the formation and

384. **Growth of the Embryo** itself. For this purpose we return to the ovule in the pistil of the flower (323). During or soon after blossoming, a cavity appears in the kernel or nucleus of the ovule (Fig. 274, *o*), lined with a delicate membrane, and so forming a closed sac, named the *embryo-sac* (*s*). In this sac or cavity, at its upper end (viz. at the end next the orifice of the ovule), appears a roundish little *vesicle* or bladder-like body (*v*), perhaps less than one thousandth of an inch in diameter. This is the embryo, or rudimentary new plant, at its very beginning. But this vesicle never becomes anything more than a grain of soft pulp, unless the ovule has been acted upon by the pollen.

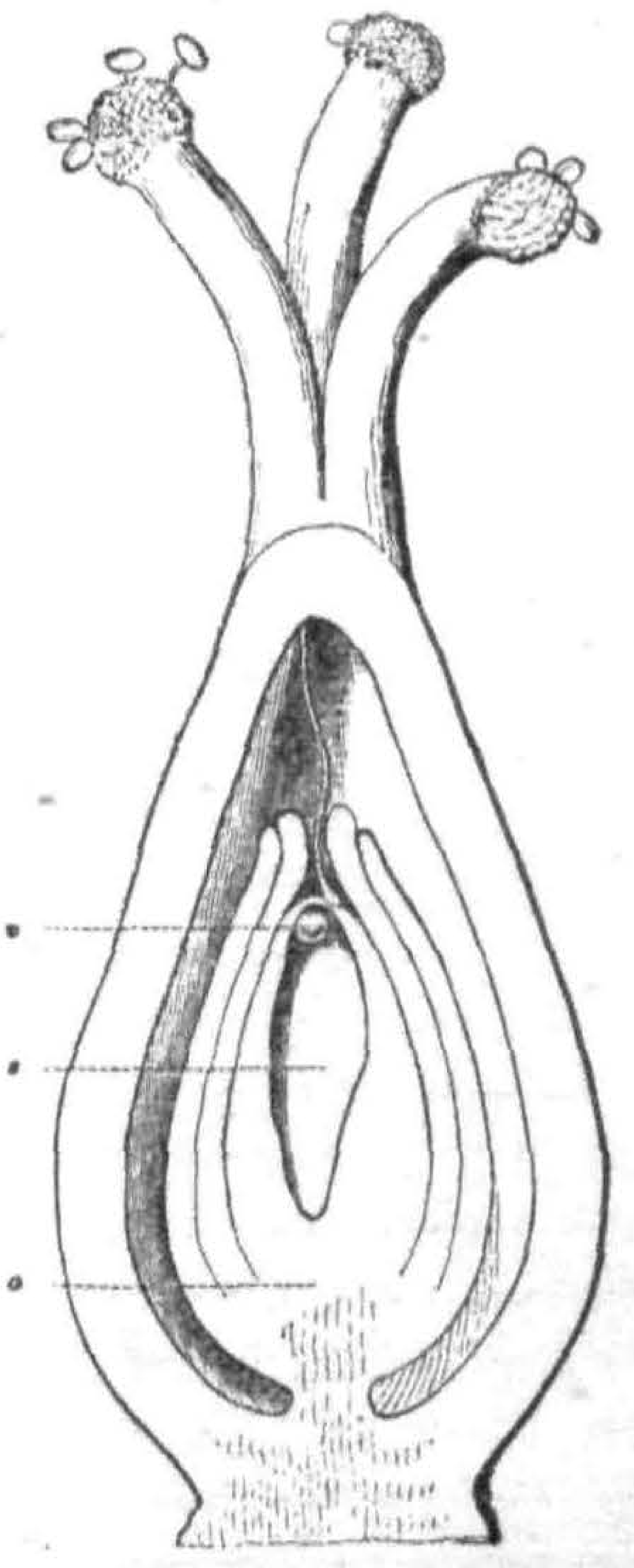


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FIG. 328. Magnified pistil of Buckwheat; the ovary and ovule divided lengthwise: some pollen on the stigmas, one grain distinctly showing its tube, which penetrates the style, reappears in the cavity of the ovary, enters the mouth of the ovule (*o*), and reaches the surface of the embryo-sac (*s*), near the embryonal vesicle (*v*).

385. The pollen (297) which falls upon the stigma grows there in a peculiar way: its delicate inner coat extends into a tube (the pollen-tube), which sinks into the loose tissue of the stigma and the interior of the style, something as the root of a seedling sinks into the loose soil, reaches the cavity of the ovary, and at length penetrates the orifice of an ovule. The point of the pollen-tube reaches the surface of the embryo-sac, and in some unexplained way causes a particle of soft pulpy or mucilaginous matter (Fig. 328) to form a membranous coat and to expand into a vesicle, which is the germ of the embryo.

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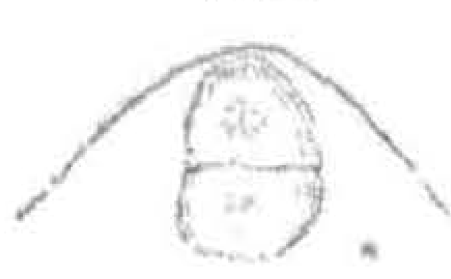

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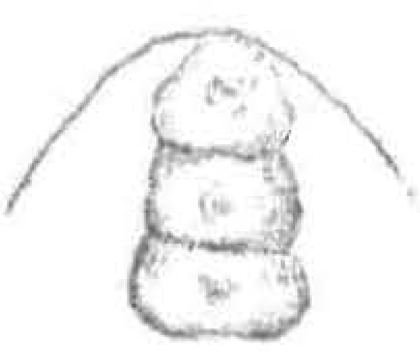

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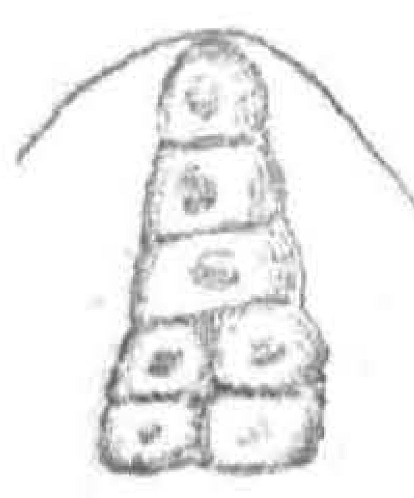

386. This vesicle (shown detached and more magnified in Fig. 329) is a specimen of what botanists call a *Cell.* Its wall of very delicate membrane encloses a mucilaginous liquid, in which there are often some minute grains, and commonly a larger soft mass (called its *nucleus*).

387. Growth takes place by this vesicle or cell, after enlarging to a certain size, dividing by the formation of a cross partition into two such cells, cohering together (Fig. 330); one of these into two more (Fig. 331); and these repeating the process by partitions formed in both directions (Fig. 332); forming a cluster or mass of cells, essentially like the st, and all proceeding from it. After increasing in number for ne time in this way, d by a continuation of same process, the em-o begins to shape it-; the upper end forms radicle or root-end, le the other end shows a notch between two lobes (Fig. 333), e lobes become the cotyledons or seed-leaves, and the embryo exists in the seed is at length completed (Fig. 336)

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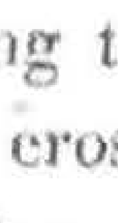

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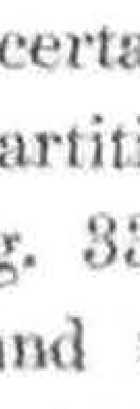

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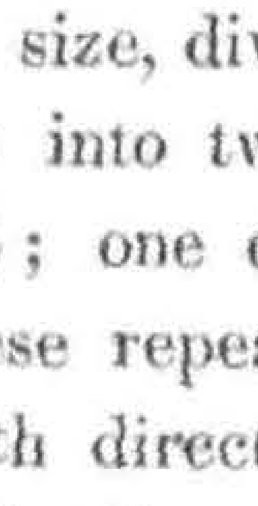

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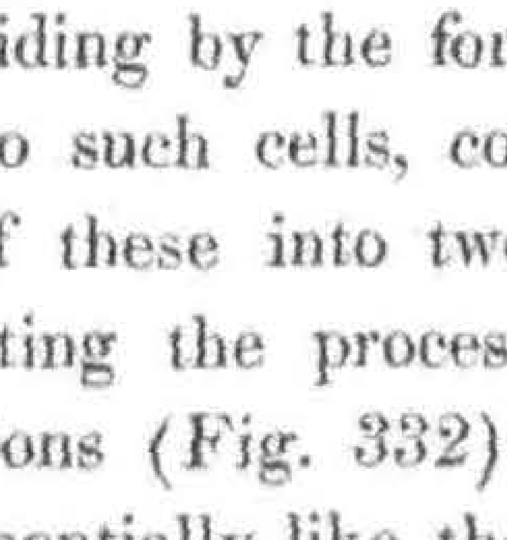

. 329. Vesicle or first cell of the embryo, with a portion of the summit of the embryo-tached. 330. Same, more advanced, divided into two cells. 331. Same, a little far-lvanced, consisting of three cells. 332. Same, still more advanced, consisting of a ass of young cells.

333. Forming embryo of Buckwheat, moderately magnified, showing a nick at the ere the cotyledons are to be. 334. Same, more advanced in growth. 335. Same, ther advanced. 336. The completed embryo, displayed and straightened out; the shown in a section when folded together in Fig. 326.

388. **The Growth of the Plantlet** when it springs from the seed is only a continuation of the same process. The bladder-like cells of which the embryo consists multiply in number by the repeated division of each cell into two. And the plantlet is merely the aggregation of a vastly larger number of these cells. This may be clearly ascertained by magnifying any part of a young plantlet. The young root, being more transparent than the rest, answers the purpose best. Fig. 56, on page 30, represents the end of the rootlet of Fig. 55, magnified enough to show the cells that form the surface. Fig. 337 and 338 are two small bits of the surface more highly magnified, showing the cells still larger. And if we make a thin slice through the young root both lengthwise and crosswise, and view it under a good microscope (Fig. 340), we may perceive that the whole interior is made up of just such cells. It is the same with the young stem and the leaves (Fig. 355, 357). It is essentially the same in the full-grown herb and the tree.

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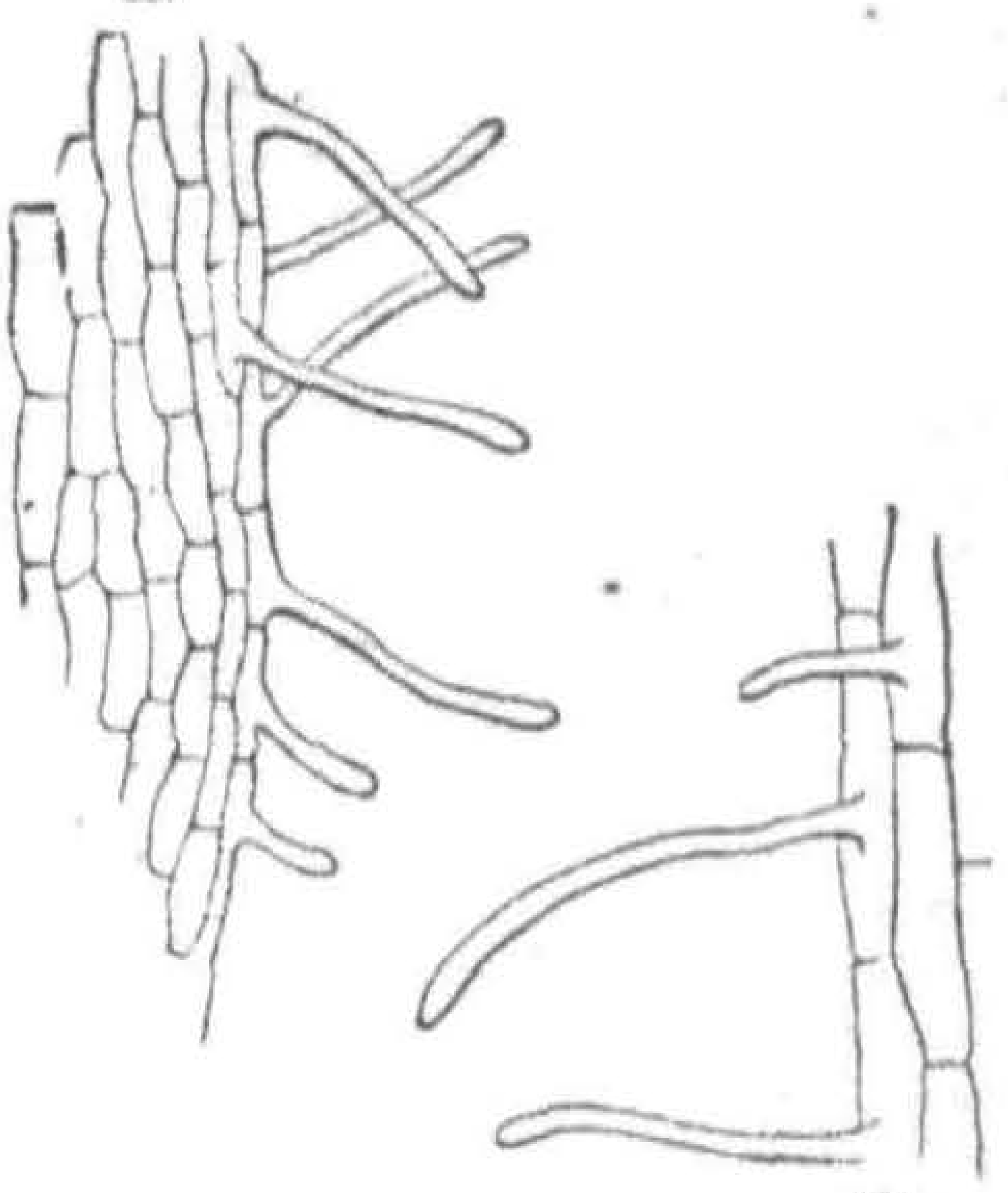

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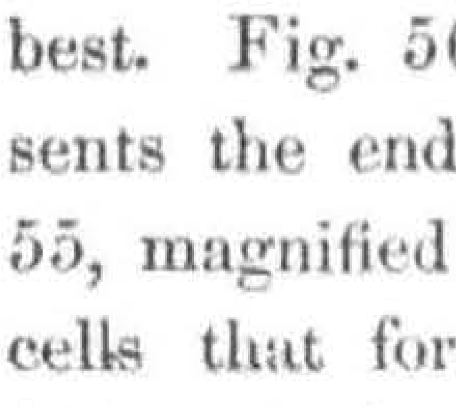
389. So the plant is an aggregation of countless millions of little vesicles, or cells (Fig. 339), as they are called, essentially like the cell it began with in the formation of the embryo (Fig. 329); and this first cell is the foundation of the whole structure, or the ancestor of all the rest. And a plant is a kind of structure built up of these individual cells, something as a house is built of bricks, — only the bricks or cells are not brought to the forming plant, but are made in it and by it; or, to give a better comparison, the plant is constructed much as a honeycomb is built up of cells, — only the plant constructs itself, and shapes its own materials into fitting forms.



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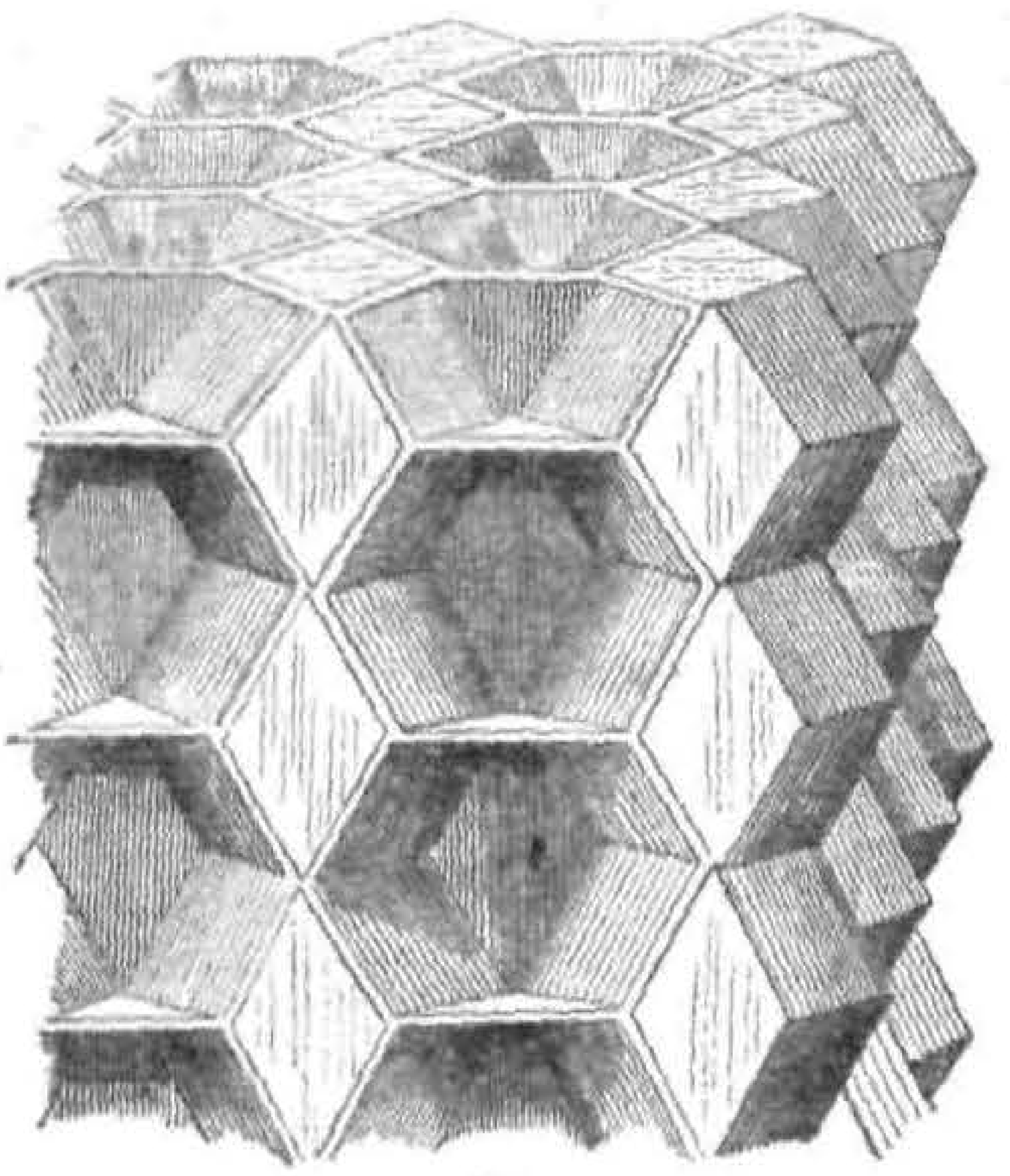
390. And vegetable growth consists of two things; — 1st, the expansion of each cell until it gets its full size (which is commonly not more than $\frac{1}{400}$ of an inch in diameter); and 2d, the multiplication

FIG. 337. Tissue from the rootlet of a seedling Maple, magnified, showing root-hairs. 338. A small portion, more magnified.

FIG. 339. A regularly twelve-sided cell, like those of Fig. 340, detached.

of the cells in number. It is by the latter, of course, that the principal increase of plants in bulk takes place.



340

LESSON XXIII.

VEGETABLE FABRIC: CELLULAR TISSUE.

391. **Organic Structure.** A mineral — such as a crystal of spar, or a piece of marble — may be divided into smaller and still smaller pieces, and yet the minutest portion that can be seen with the microscope will have all the characters of the larger body, and be capable of still further subdivision, if we had the means of doing it, into just such particles, only of smaller size. A plant may also be divided into a number of similar parts: first into branches; then each branch or stem, into joints or similar parts (34), each with its leaf or pair of leaves. But if we divide these into pieces, the pieces are not all alike, nor have they separately the properties of the whole; they are not whole things, but fragments or slices.

392. If now, under the microscope, we subdivide a leaf, or a piece of stem or root, we come down in the same way to the set of similar things it is made of, — to cavities with closed walls, — to *Cells*, as we call them (386), essentially the same everywhere, however they may vary in shape. These are the *units*, or the elements of which every part consists; and it is their growth and their multiplication which

FIG. 340. Magnified view, or diagram, of some perfectly regular cellular tissue, formed of twelve-sided cells, cut crosswise and lengthwise.

make the growth of the plant, as was shown in the last Lesson. We cannot divide them into similar smaller parts having the properties of the whole, as we may any mineral body. We may cut them in pieces; but the pieces are only mutilated parts of a cell. This is a peculiarity of organic things (2, 3): it is *organic structure.* Being composed of cells, the main structure of plants is called

393. **Cellular Tissue.** The cells, as they multiply, build up the tissues or fabric of the plant, which, as we have said (389), may be likened to a wall or an edifice built of bricks, or still better to a honeycomb composed of ranges of cells (Fig. 340).

394. The walls of the cells are united where they touch each other; and so the partition appears to be a simple membrane, although it is really double; as may be shown by boiling the tissue a few minutes and then pulling the parts asunder. And in soft fruits the cells separate in ripening, although they were perfectly united into a tissue, when green, like that of Fig. 340.

395. In that figure the cells fit together perfectly, leaving no interstices, except a very small space at some of the corners. But in most leaves, the cells are loosely heaped together, leaving spaces or passages of all sizes (Fig. 356); and in the leaves and stems of aquatic and marsh plants, in particular, the cells are built up into narrow partitions, which form the sides of large and regular canals or passages (as shown in Fig. 341). These passages form the holes or cavities so conspicuous on cutting across any of these plants, and which are always filled with air. They may be likened to a stack of chimneys, built up of cells in place of bricks.

396. When small and irregular, the interstices are called *intercellular spaces* (that is, spaces between the cells). When large and regular, they are named *intercellular passages* or *air-passages.*

397. It will be noticed that in slices of the root, stem, or any tissue where the cells are not partly separate, the boundaries of the cells are usually more or less six-sided, like the cells of a honeycomb; and this is apt to be the case in whatever direction the slice is made, whether crosswise, lengthwise, or obliquely. The reason of this is easy to see. The natural figure of the cell is globular. Cells which are not pressed upon by others are generally round or roundish (except when they grow in some particular direction), as we see in the green pulp of many leaves. When a quantity of spheres (such, for instance, as a pile of cannon-balls) are heaped up, each one in the interior of the heap is touched by twelve others. If the spheres be

soft and yielding, as young cells are, when pressed together they will become twelve-sided, like that in Fig. 339. And a section in any direction will be six-sided, as are the meshes in Fig. 340.

398. The size of the common cells of plants varies from about the thirtieth to the thousandth of an inch in diameter. An ordinary size is from $\frac{1}{300}$ to $\frac{1}{500}$ of an inch; so that there may generally be from 27 to 125 millions of cells in the compass of a cubic inch!

399. Now when it is remembered that many stems shoot up at the rate of an inch or two a day, and sometimes of three or four inches, knowing the size of the cells, we may form some conception of the rapidity of their formation. The giant Puff-ball has been known to enlarge from an inch or so to nearly a foot in diameter in a single night; but much of this is probably owing to expansion. We take therefore a more decisive, but equally extraordinary case, in the huge flowering stem of the Century-Plant. After waiting many years, or even for a century, to gather strength and materials for the effort, Century-Plants in our conservatories send up a flowering stalk, which grows day after day at the rate of a foot in twenty-four hours, and becomes about six inches in diameter. This, supposing the cells to average $\frac{1}{300}$ of an inch in diameter, requires the formation of over twenty thousand millions of cells in a day!

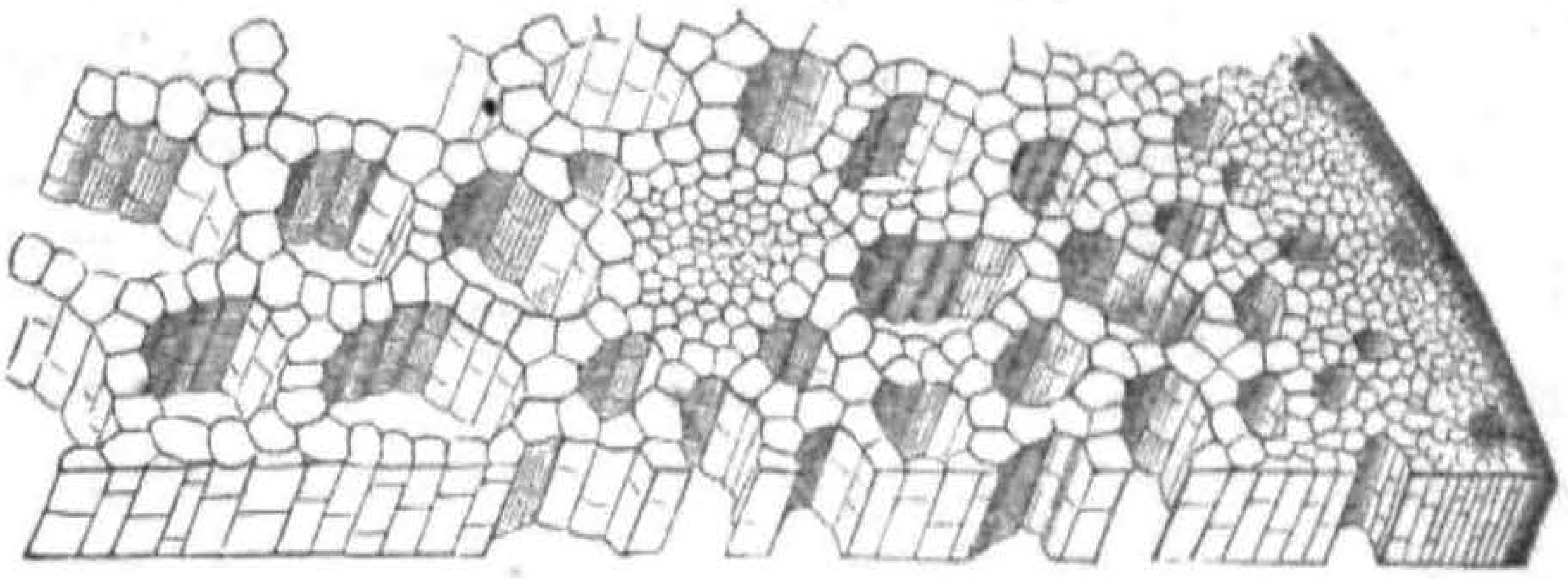
400. The walls of the cells are almost always colorless. The green color of leaves and young bark, and all the brilliant hues of flowers, are due to the contents of the cells, seen through their more or less transparent walls.

401. At first the walls are always very thin. In all soft parts they remain so; but in other cases they thicken on the inside and harden, as we see in the stone of stone-fruits, and in all hard wood (Fig. 345) Sometimes this thickening continues until the cell is nearly filled up solid.

402. The walls of cells are perfectly closed and whole, at least in all young and living cells. Those with thickened walls have thin places, indeed; but there are no holes opening from one cell into another. And yet through these closed cells the sap and all the juices are conveyed from one end of the plant to the other.

403. Vegetable cells may vary widely in shape, particularly when not combined into a tissue or solid fabric. The hairs of plants, for example, are cells drawn out into tubes, or are composed of a row of cells, growing on the surface. Cotton consists of simple long hairs on the coat of the seed; and these hairs are single cells. The hair-

like bodies which abound on young roots are very slender projections of some of the superficial cells, as is seen in Fig. 337. Even the fibres of wood, and what are called vessels in plants, are only peculiar forms or transformations of cells.



341

LESSON XXIV.

VEGETABLE FABRIC: WOOD.

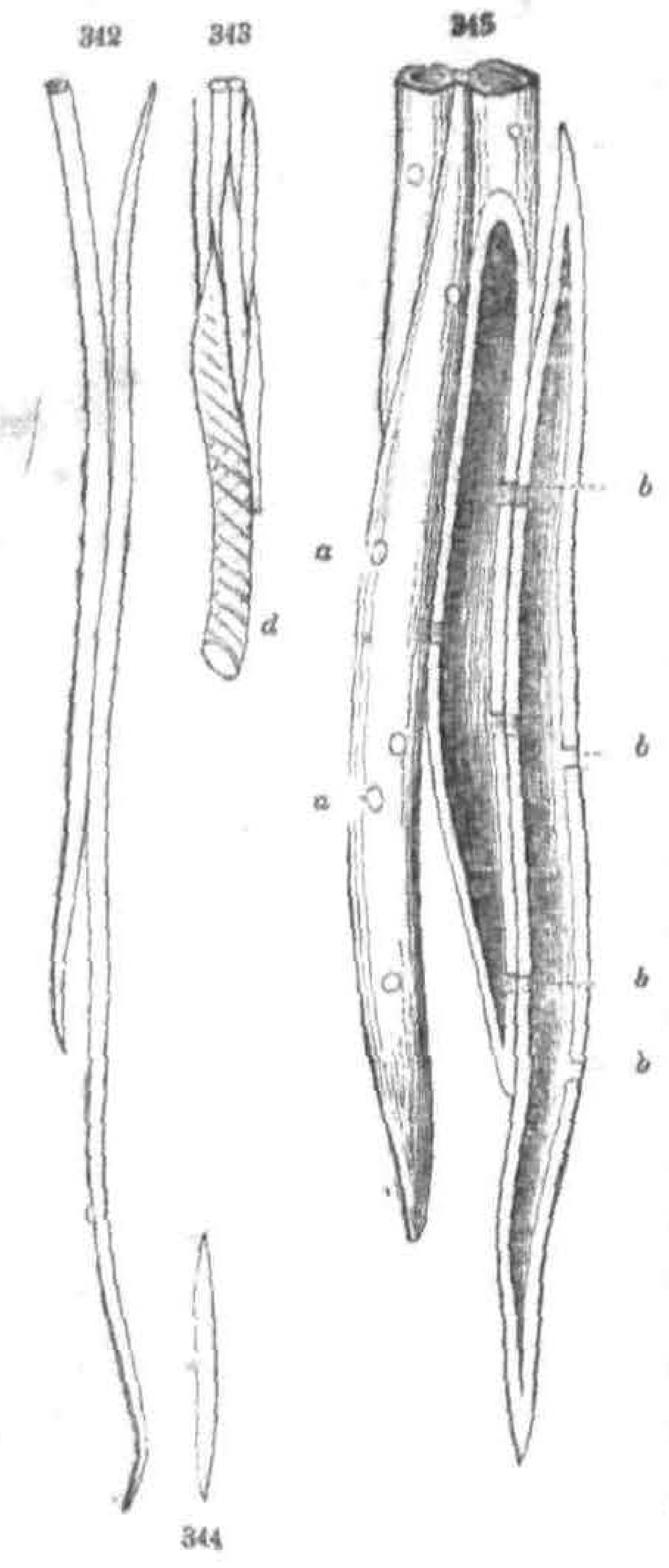
404. CELLULAR TISSUE, such as described in the last Lesson, makes up the whole structure of all very young plants, and the whole of Mosses and other vegetables of the lowest grade, even when full grown. But this fabric is too tender or too brittle to give needful strength and toughness for plants which are to rise to any considerable height and support themselves. So all such plants have also in their composition more or less of

405. **Wood.** This is found in all common herbs, as well as in shrubs and trees; only there is not so much of it in proportion to the softer cellular tissue. It is formed very early in the growth of the root, stem, and leaves; traces of it appearing in large embryos even while yet in the seed.

406. Wood is likewise formed of cells, — of cells which at first are just like those that form the soft parts of plants. But early in their growth, some of these lengthen and at the same time thicken their walls; these are what is called *Woody Fibre* or *Wood-Cells;* others grow to a greater size, have thin walls with various markings upon them, and often run together end to end so as to form pretty

FIG. 341. Part of a slice across the stem of the Calla, or rather Richardia Africana, magnified

large tubes, comparatively; these are called *Ducts*, or sometime *Vessels*. Wood almost always consists of both woody fibres and ducts



variously intermingled, and combined into bundles or threads which run lengthwise through the root and stem, and are spread out to form the framework of the leaves (136). In trees and shrubs they are so numerous and crowded together, that they make a solid mass of wood. In herbs they are fewer, and often scattered. That is all the difference.

407. The porosity of some kinds of wood, which is to be seen by the naked eye, as in mahogany and Oak-wood, is owing to a large sort of ducts. These generally contain air, except in very young parts, and in the spring of the year, when they are often gorged with sap, as we see in a wounded Grape-vine, or in the trunk of a Sugar-Maple at that time. But in woody plants through the season, the sap is usually carried up from the roots to the leaves by the

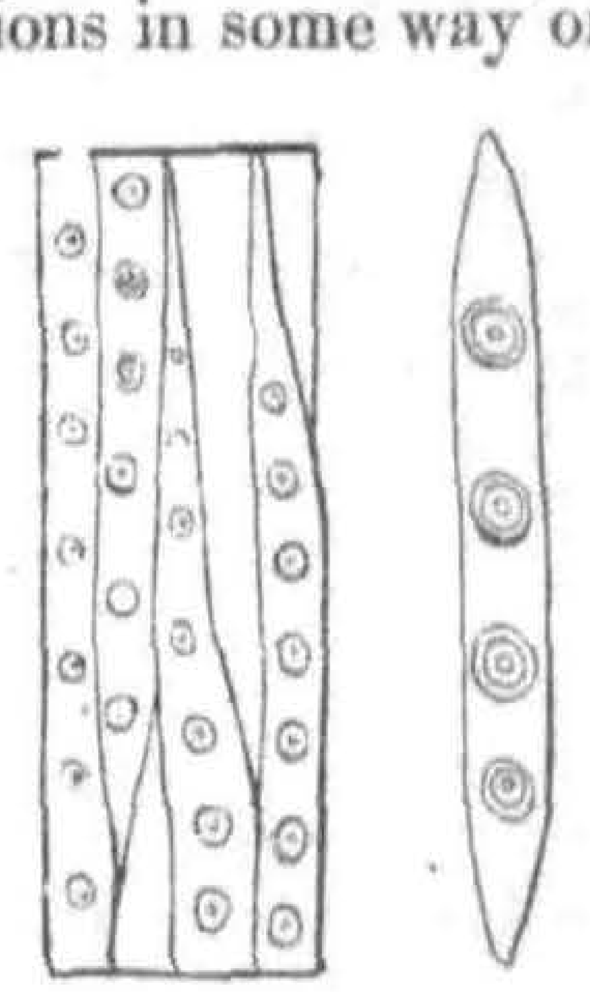
408. **Wood-Cells, or Woody Fibre.** (Fig. 342–345.) These are small tubes, commonly between one and two thousandths, but in Pine-wood sometimes two or three hundredths, of an inch in diameter. Those from the tough bark of the Basswood, shown in Fig. 342, are only the fifteen-hundredth of an inch wide. Those of Buttonwood (Fig. 345) are larger, and are here highly magnified besides. They also show the way wood-cells are commonly put together, namely, with their tapering ends overlapping each other, — spliced together, as it were, — thus giving more strength and toughness to the stem, &c.

FIG. 342. Two wood-cells from the inner or fibrous bark of the Linden or Basswood. 343. Some tissue of the wood of the same, viz. wood-cells, and below (*d*) a portion of a spirally marked duct. 344. A separate wood-cell. All equally magnified.

FIG. 345. Some wood-cells of Buttonwood, highly magnified: *a*, thin spots in the walls, looking like holes; on the right-hand side, where the walls are cut through, these (*b*) are seen in profile.

409. In hard woods, such as Hickory, Oak, and Buttonwood (Fig. 345), the walls of these tubes are very thick, as well as dense; while in soft woods, such as White-Pine and Basswood, they are pretty thin.

410. Wood-cells, like other cells (at least when young and living), have no openings; each has its own cavity, closed and independent. They do not form anything like a set of pipes opening one into another, so as to convey an unbroken stream of sap through the plant, in the way people generally suppose. The contents can pass from one cell to another only by getting through the partitions in some way or other. And so short are the individual wood-cells generally, that, to rise a foot in such a tree as the Basswood, the sap has to pass through about two thousand partitions!



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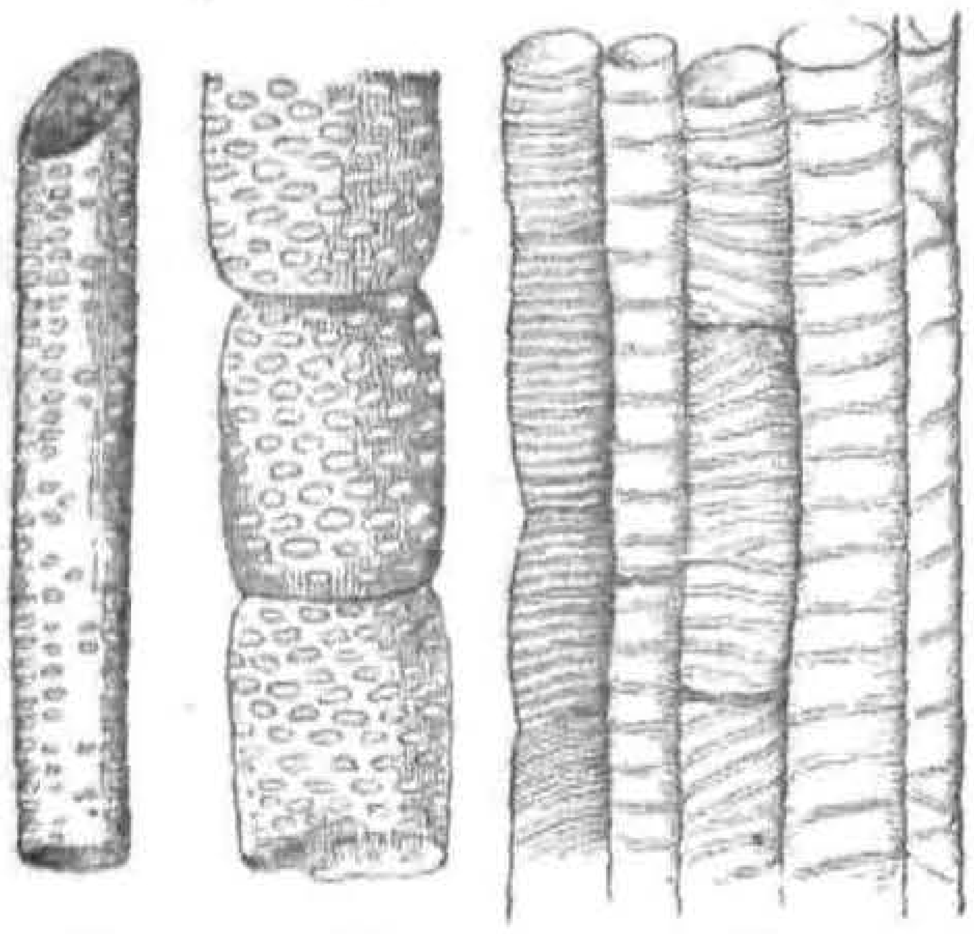
411. But although there are no holes (except by breaking away when old), there are plenty of thin places, which look like perforations; and through these the sap is readily transferred from one cell to another, in a manner to be explained further on (487). Some of them are exhibited in Fig. 345, both as looked directly down upon, when they appear as dots or holes, and in profile where the cells are cut through. The latter view shows what they really are, namely, very thin places in the thickness of the wall; and also that a thin place in one cell exactly corresponds to one in the contiguous wall of the next cell. In the wood of the Pine family, these thin spots are much larger, and are very conspicuous in a thin slice of wood under the microscope (Fig. 346, 347); — forming stamps impressed as it were upon each fibre of every tree of this great family, by which it may be known even in the smallest fragment of its wood.

412. Wood-cells in the bark are generally longer, finer, and tougher than those of the proper wood, and appear more like fibres. For example, Fig. 344 represents a cell of the wood of Basswood, of average length, and Fig. 342 one (and part of another) of the fibrous bark, both drawn to the same scale. As these long cells form the principal part of fibrous bark, or *bast*, they are named *Bast-cells* or *Bast-fibres*. These give the great toughness to the inner bark of Basswood (i. e. Bast-wood) and of Leatherwood; and they

FIG. 346. A bit of Pine-shaving, highly magnified, showing the large circular thin spots of the wall of the wood-cells. 347. A separate wood-cell, more magnified, the varying thickness of the wall at these spots showing as rings.

furnish the invaluable fibres of flax and hemp; the wood of the stem being tender, brittle, and destroyed by the processes which separate for use the tough and slender bast-cells.

413. **Ducts** (Fig. 348 – 350) are larger than wood-cells, some of them having a calibre large enough to be seen by the naked eye, when cut across (407), although they are usually much too small for this. They are either long single cells, or are formed of a row of cells placed end to end. Fig. 349, a piece of a large dotted duct, and two of the ducts in Fig. 350, show this by their joints, which mark the boundaries of the several cells they are composed of.



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414. The walls of ducts under the microscope display various kinds of markings. In what are called

Dotted Ducts (Fig. 348, 349), which are the commonest and the largest of all, — their cut ends making the visible porosity of Oak-wood, — the whole wall is apparently riddled with holes; but until they become old, these are only thin places.

Spiral Ducts, or *Spiral Vessels*, also the varieties of these called *Annular* or *Banded Ducts* (Fig. 350), are marked by a delicate fibre spirally coiled, or by rings or bands, thickening the wall. In the genuine spiral duct, the thread may be uncoiled, tearing the transparent wall in pieces; — as may be seen by breaking most young shoots, or the leaves of Strawberry or Amaryllis, and pulling the broken ends gently asunder, uncoiling these gossamer threads in abundance. In Fig. 355, some of these various sorts of ducts or vessels are shown in their place in the wood.

415. *Milk-Vessels*, *Turpentine-Vessels*, *Oil-Receptacles*, and the like, are generally canals or cavities formed between or among the cells, and filled with the particular products of the plant.

FIG. 348. Part of a dotted duct from a Grape-vine. 349. A similar one, evidently composed of a row of cells. 350. Part of a bundle of spiral and annular ducts from the stem of Polygonum orientale, or Princes' Feather. All highly magnified.

LESSON XXV.

ANATOMY OF THE ROOT, STEM, AND LEAVES.

416. HAVING in the last preceding Lessons learned what the materials of the vegetable fabric are, we may now briefly consider how they are put together, and how they act in carrying on the plant's operations.

417. The root and the stem are so much alike in their internal structure, that a description of the anatomy of the latter will answer for the former also.

418. **The Structure of the Rootlets**, however, or the tip of the root, demands a moment's attention. The tip of the root is the newest part, and is constantly renewing itself so long as the plant is active (67). It is shown magnified in Fig. 56, and is the same in all rootlets as in the first root of the seedling. The new roots, or their new parts, are mainly concerned in imbibing moisture from the ground; and the newer they are, the more actively do they absorb. The absorbing ends of roots are entirely composed of soft, new, and very thin-walled cellular tissue; it is only farther back that some wood-cells and ducts are found. The moisture (and probably also air) presented to them is absorbed through the delicate walls, which, like those of the cells in the interior, are destitute of openings or pores visible even under the highest possible magnifying power.

419. But as the rootlet grows older, the cells of its external layer harden their walls, and form a sort of skin, or *epidermis* (like that which everywhere covers the stem and foliage above ground), which greatly checks absorption. Roots accordingly cease very actively to imbibe moisture almost as soon as they stop growing (67).

420. Many of the cells of the surface of young rootlets send out a prolongation in the form of a slender hair-like tube, closed of course at the apex, but at the base opening into the cavity of the cell. These tubes or *root-hairs* (shown in Fig. 55 and 56, and a few of them, more magnified, in Fig. 337 and 338), sent out in all directions into the soil, vastly increase the amount of absorbing surface which the root presents to it.

421. **Structure of the Stem** (also of the body of the root). At the beginning, when the root and stem spring from the seed, they consist

almost entirely of soft and tender cellular tissue. But as they grow, wood begins at once to be formed in them.

422. This woody material is arranged in the stem in two very different ways in different plants, making two sorts of wood. One sort we see in a Palm-stem, a rattan, and a Corn-stalk (Fig. 351); the other we are familiar with in Oak, Maple, and all our common kinds of wood. In the first, the wood is made up of separate threads, scattered here and there throughout the whole diameter of the stem. In the second the wood is all collected to form a layer (in a slice across appearing as a ring) of wood, between a central cellular part which has none in it, the *Pith*, and an outer cellular part, the *Bark*. This last is the plan of all our Northern trees and shrubs, and of the greater part of our herbs. The first kind is

423. **The Endogenous Stem**; so named from two Greek words meaning "inside-growing," because, when it lasts from year to year, the new wood which is added is interspersed among the older threads of wood, and in old stems the hardest and oldest wood is near the surface, and the youngest and softest towards the centre. All the plants represented in Fig. 47, on p. 19, (except the anomalous Cycas,) are examples of Endogenous stems. And all such belong to plants with only one cotyledon or seed-leaf to the embryo (32). Botanists therefore call them *Endogenous* or *Monocotyledonous Plants*, using sometimes one name, and sometimes the other. Endogenous stems have no separate pith in the centre, no distinct bark, and no layer or ring of wood between these two; but the threads of wood are scattered throughout the whole, without any particular order. This is very different from

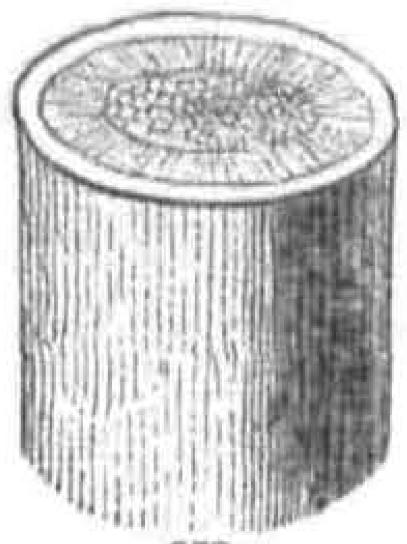
351

424. **The Exogenous Stem**, the one we have most to do with, since all our Northern trees and shrubs are constructed on this plan. It belongs to all plants which have two cotyledons to the embryo (or more than two, such as Pines, 33); so that we call these either *Exogenous* or *Dicotyledonous Plants* (16), accordingly as we take the name from the stem or from the embryo.

425. In the Exogenous stem, as already stated, the wood is all collected into one zone, surrounding a pith of pure cellular tissue in the centre, and surrounded by a distinct and separable bark, the

FIG. 351. Section of a Corn-stalk (an endogenous stem), both crosswise and lengthwise.

outer part of which is also cellular. This structure is very familiar in common wood. It is really just the same in the stem of an herb,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only the wood is much less in quantity. Compare, for instance, a cross-section of the stem of Flax (Fig. 352) with that of a shoot of Maple or Horsechestnut of the same age. In an herb, the wood at the beginning consists of separate threads or little wedges of wood; but these, however few and scattered they may be, are all so placed in the stem as to mark out a zone (or in the cross-section a ring) of wood, dividing the pith within from the bark without.

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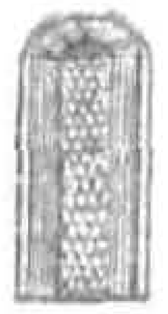

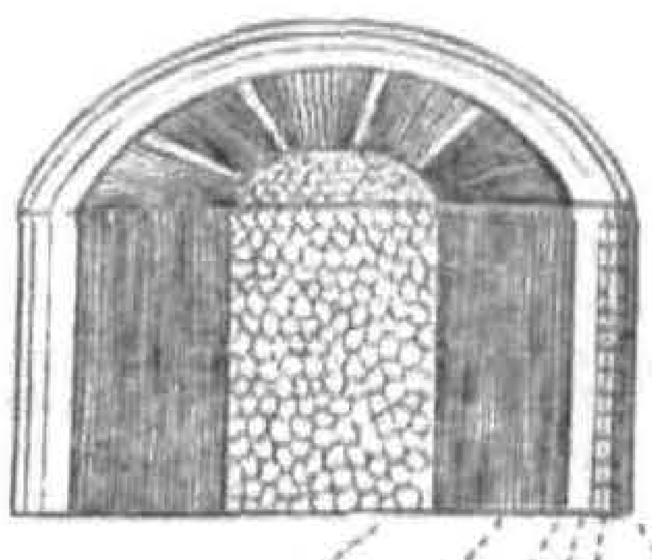
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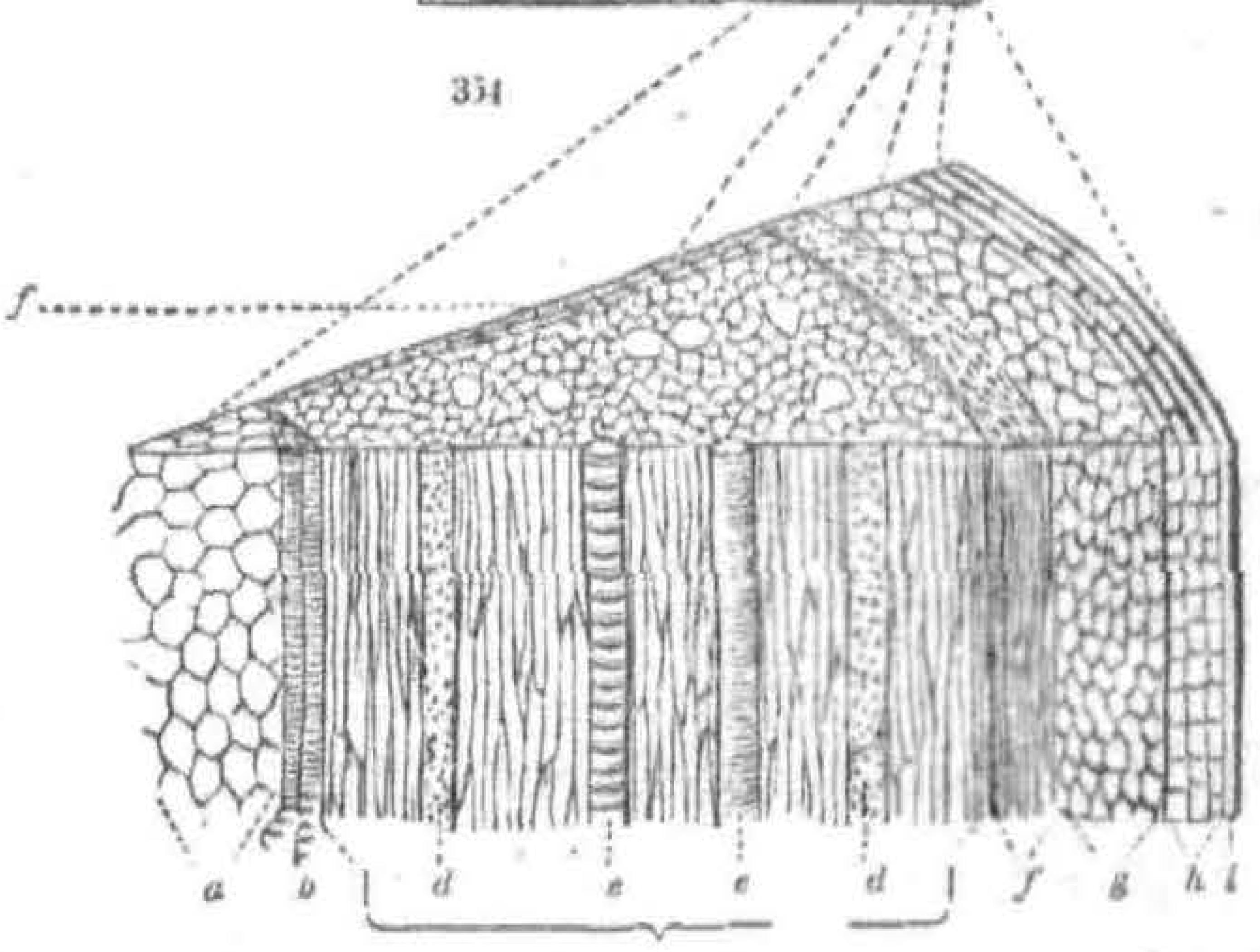

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426. The accompanying figures (which are diagrams rather than exact delineations) may serve to illustrate the anatomy of a woody exogenous stem, of one year old. The parts are explained in the references below. In the centre is the *Pith*. Surrounding this is the layer of *Wood*, consisting both of wood-cells and of ducts or vessels. From the pith to the bark on all sides run a set of narrow plates of cellular tissue, called *Medullary Rays*: these make the *silver-grain* of wood. On the cross-section they appear merely as narrow lines; but in wood cut lengthwise parallel to them, their faces show as glimmer-

FIG. 352. Cross-section of the stem of Flax, showing its bark, wood, and pith.

FIG. 353. Piece of a stem of Soft Maple, of a year old, cut crosswise and lengthwise.

FIG. 354. A portion of the same, magnified.

FIG. 355. A small piece of the same, taken from one side, reaching from the bark to the pith, and highly magnified: *a*, a small bit of the pith; *b*, spiral ducts of what is called the *medullary sheath*; *c*, the wood; *d*, *d*, dotted ducts in the wood; *e*, *e*, annular ducts; *f*, the liber or inner bark; *g*, the green bark; *h*, the corky layer; *i*, the skin, or epidermis; *f*, one of the medullary rays, or plates of silver-grain, seen on the cross-section.

ing plates, giving a peculiar appearance to Oak, Maple, and other wood with large medullary rays.

427. *The Bark* covers and protects the wood. At first it is all cellular, like the pith; but soon some slender woody fibres, called bast-cells (Fig. 342), generally appear in it, next the wood, forming

The Liber, or Fibrous Bark, the inner bark; to which belongs the fine fibrous *bast* or *bass* of Basswood, and the tough and slender fibres of flax and hemp, which are spun and woven, or made into cordage. In the Birch and Beech the inner bark has few if any bast-cells in its composition.

The Cellular or Outer Bark consists of cellular tissue only. It is distinguished into two parts, an inner and an outer, viz.:—

The Green Bark, or Green Layer, which consists of tender cells, containing the same green matter as the leaves, and serving the same purpose. In the course of the first season, in woody stems, this becomes covered with

The Corky Layer, so named because it is the same substance as *cork;* common cork being the thick corky layer of the bark of the Cork-Oak, of Spain. It is this which gives to the stems or twigs of shrubs and trees the aspect and the color peculiar to each; namely, light gray in the Ash, purple in the Red Maple, red in several Dogwoods, &c. Lastly,

The Epidermis, or skin of the plant, consisting of a layer of thick-sided empty cells, covers the whole.

428. **Growth of the Stem year after year.** So much for an exogenous stem only one year old. The stems of herbs perish at the end of the season. But those of shrubs and trees make a new growth every year. It is from their mode of growth in diameter that they take the name of *exogenous*, i. e. *outside-growing*. The second year, such a stem forms a second layer of wood outside of the first; the third year, another outside of that; and so on, as long as the tree lives. So that the trunk of an exogenous tree, when cut off at the base, exhibits as many concentric rings of wood as it is years old. Over twelve hundred layers have actually been counted on the stump of an aged tree, such as the Giant Cedar or Redwood of California; and there are doubtless some trees now standing in various parts of the world which were already in existence at the beginning of the Christian era.

429. As to the bark, the green layer seldom grows much after the first season. Sometimes the corky layer grows and forms new layers, inside of the old, for a good many years, as in the Cork-Oak,

the Sweet Gum-tree, and the White and the Paper Birch. But it all dies after a while; and the continual enlargement of the wood within finally stretches it more than it can bear, and sooner or later cracks and rends it, while the weather acts powerfully upon its surface; so the older bark perishes and falls away piecemeal year by year.

430. But the inner bark, or liber, does make a new growth annually, as long as the tree lives, inside of that formed the year before, and next the surface of the wood. More commonly the liber occurs in the form of thin layers, which may be distinctly counted, as in Basswood: but this is not always the case. After the outer bark is destroyed, the older and dead layers of the inner bark are also exposed to the weather, are riven or split into fragments, and fall away in succession. In many trees the bark acquires a considerable thickness on old trunks, although all except the innermost portion is dead; in others it falls off more rapidly; in the stems of Honeysuckles and Grape-vines, the bark all separates and hangs in loose shreds when only a year or two old.

431. **Sap-wood.** In the wood, on the contrary, — owing to its growing on the outside alone, — the older layers are quietly buried under the newer ones, and protected by them from all disturbance. All the wood of the young sapling may be alive, and all its cells or woody tubes active in carrying up the sap from the roots to the leaves. It is all *Sap-wood* or *Alburnum*, as young and fresh wood is called. But the older layers, removed a step farther every year from the region of growth, — or rather the zone of growth every year removed a step farther from them, — soon cease to bear much, if any, part in the circulation of the tree, and probably have long before ceased to be alive. Sooner or later, according to the kind of tree, they are turned into

432. **Heart-wood**, which we know is drier, harder, more solid, and much more durable as timber, than sap-wood. It is generally of a different color, and it exhibits in different species the hue peculiar to each, such as reddish in Red-Cedar, brown in Black-Walnut, black in Ebony, &c. The change of sap-wood into heart-wood results from the thickening of the walls of the wood-cells by the deposition of hard matter, lining the tubes and diminishing their calibre; and by the deposition of a vegetable coloring-matter peculiar to each species.

433. The heart-wood, being no longer a living part, may decay

and often does so, without the least injury to the tree, except by impairing the strength of the trunk, and so rendering it more liable to be overthrown.

434. **The Living Parts of a Tree**, of the exogenous kind, are only these: first, the rootlets at one extremity; second, the buds and leaves of the season at the other; and third, a zone consisting of the newest wood and the newest bark, connecting the rootlets with the buds or leaves, however widely separated these may be, — in the largest trees from two to four hundred feet apart. And these parts of the tree are all renewed every year. No wonder, therefore, that trees may live so long, since they annually reproduce everything that is essential to their life and growth, and since only a very small part of their bulk is alive at once. The tree survives, but nothing now living has existed long. In it, as elsewhere, life is a transitory thing, ever abandoning the *old*, and displaying itself afresh in the *new*.

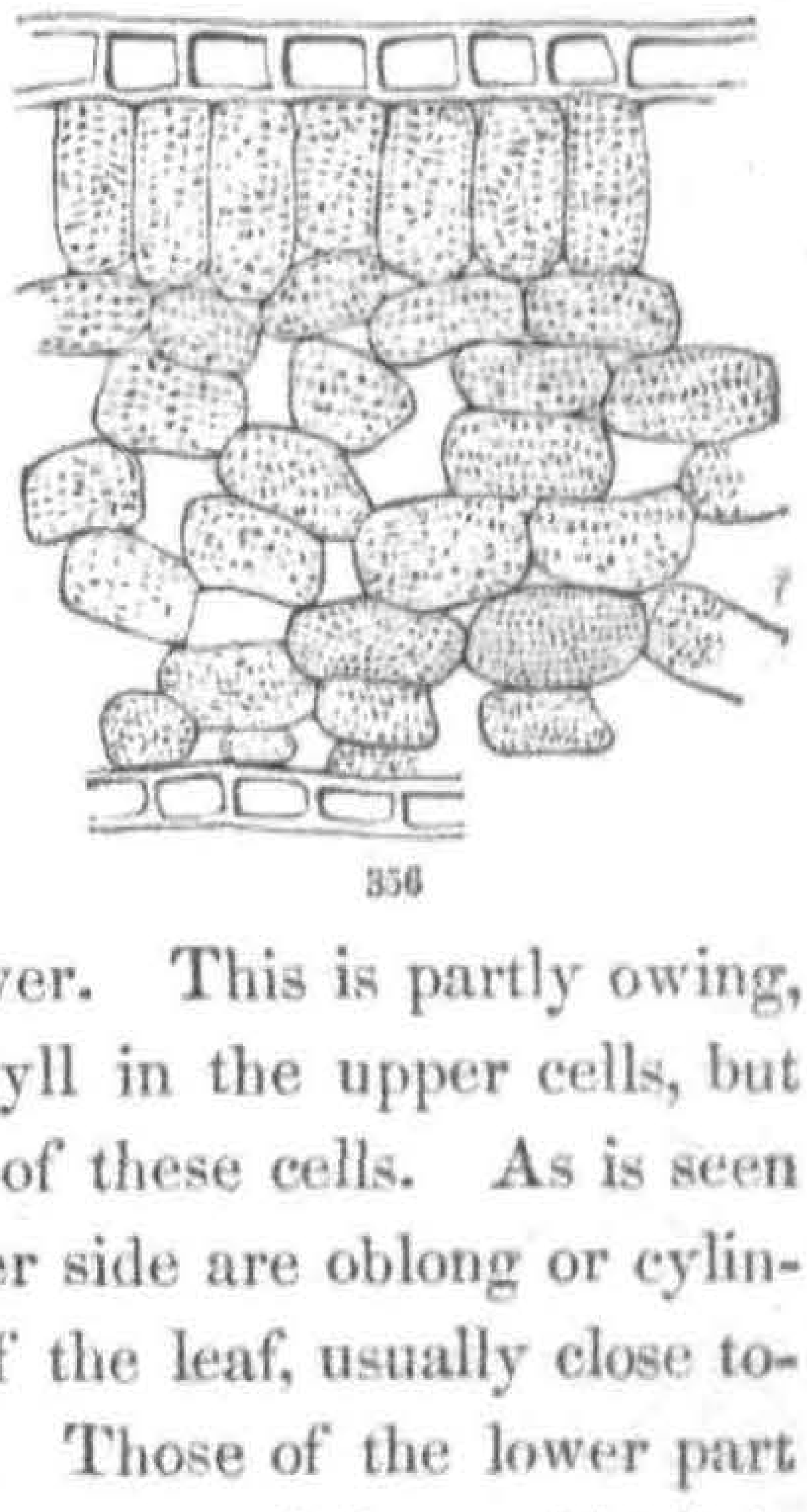
435. **Cambium-Layer.** The new growth in the stem, by which it increases in diameter year after year, is confined to a narrow line between the wood and the inner bark. *Cambium* is the old name for the mucilage which is so abundant between the bark and the wood in spring. It was supposed to be poured out there, and that the bark really separated from the wood at this time. This is not the case. The newest bark and wood are still united by a delicate tissue of young and forming cells, — called the *Cambium-layer*, — loaded with a rich mucilaginous sap, and so tender that in spring the bark may be raised from the wood by the slightest force. Here, nourished by this rich mucilage, new cells are rapidly forming by division (387 – 390); the inner ones are added to the wood, and the outer to the bark, so producing the annual layers of the two, which are ever renewing the life of the trunk.

436. At the same time new rootlets, growing in a similar way, are extending the roots beneath; and new shoots, charged with new buds, annually develop fresh crops of leaves in the air above. Only, while the additions to the wood and bark remain as a permanent portion of the tree, or until destroyed by decay, the foliage is temporary, the crop of leaves being annually thrown off after they have served their purpose.

437. **Structure of the Leaf.** Leaves also consist both of a woody and a cellular part (135). The woody part is the framework of ribs and veins, which have already been described in full (136 – 147).

They serve not only to strengthen the leaf, but also to bring in the ascending sap, and to distribute it by the veinlets throughout every part. The cellular portion is the green pulp, and is nearly the same as the green layer of the bark. So that the leaf may properly enough be regarded as a sort of expansion of the fibrous and green layers of the bark. It has of course no corky layer; but the whole is covered by a transparent skin or *epidermis*, resembling that of the stem.

438. The green pulp consists of cells of various forms, usually loosely arranged, so as to leave many irregular spaces, or air-passages, communicating with each other throughout the whole interior of the leaf (Fig. 356). The green color is owing to a peculiar green matter lying loose in the cells, in form of minute grains, named *Chlorophyll* (i. e. the green of leaves). It is this substance, seen through the transparent walls of the cells where it is accumulated, which gives the common green hue to vegetation, and especially to foliage.



356

439. The green pulp in most leaves forms two principal layers; an upper one, facing the sky, and an under one, facing the ground. The upper one is always deeper green in color than the lower. This is partly owing, perhaps, to a greater amount of chlorophyll in the upper cells, but mainly to the more compact arrangement of these cells. As is seen in Fig. 356 and 357, the cells of the upper side are oblong or cylindrical, and stand endwise to the surface of the leaf, usually close together, leaving hardly any vacant spaces. Those of the lower part of the leaf are apt to be irregular in shape, most of them with their longer diameter parallel to the face of the leaf, and are very loosely arranged, leaving many and wide air-chambers. The green color underneath is therefore diluted and paler.

440. In many plants which grow where they are subject to drought, and which hold their leaves during the dry season (the Oleander for example), the greater part of the thickness of the leaf consists of layers of long cells, placed endwise and very much com-

FIG. 356. Section through the thickness of a leaf of the Star Anise (Illicium), of Florida, magnified. The upper and the lower layers of thick-walled and empty cells represent the epidermis or skin. All those between are cells of the green pulp, containing grains of chlorophyll.

pacted, so as to expose as little surface as possible to the direct action of the hot sun. On the other hand, the leaves of marsh plants, and of others not intended to survive a drought, have their cells more loosely arranged throughout. In such leaves the epidermis, or skin, is made of only one layer of cells; while in the Oleander, and the like, it consists of three or four layers of hard and thick-walled cells. In all this, therefore, we plainly see an arrangement for tempering the action of direct sunshine, and for restraining a too copious evaporation, which would dry up and destroy the tender cells, at least when moisture is not abundantly supplied through the roots.

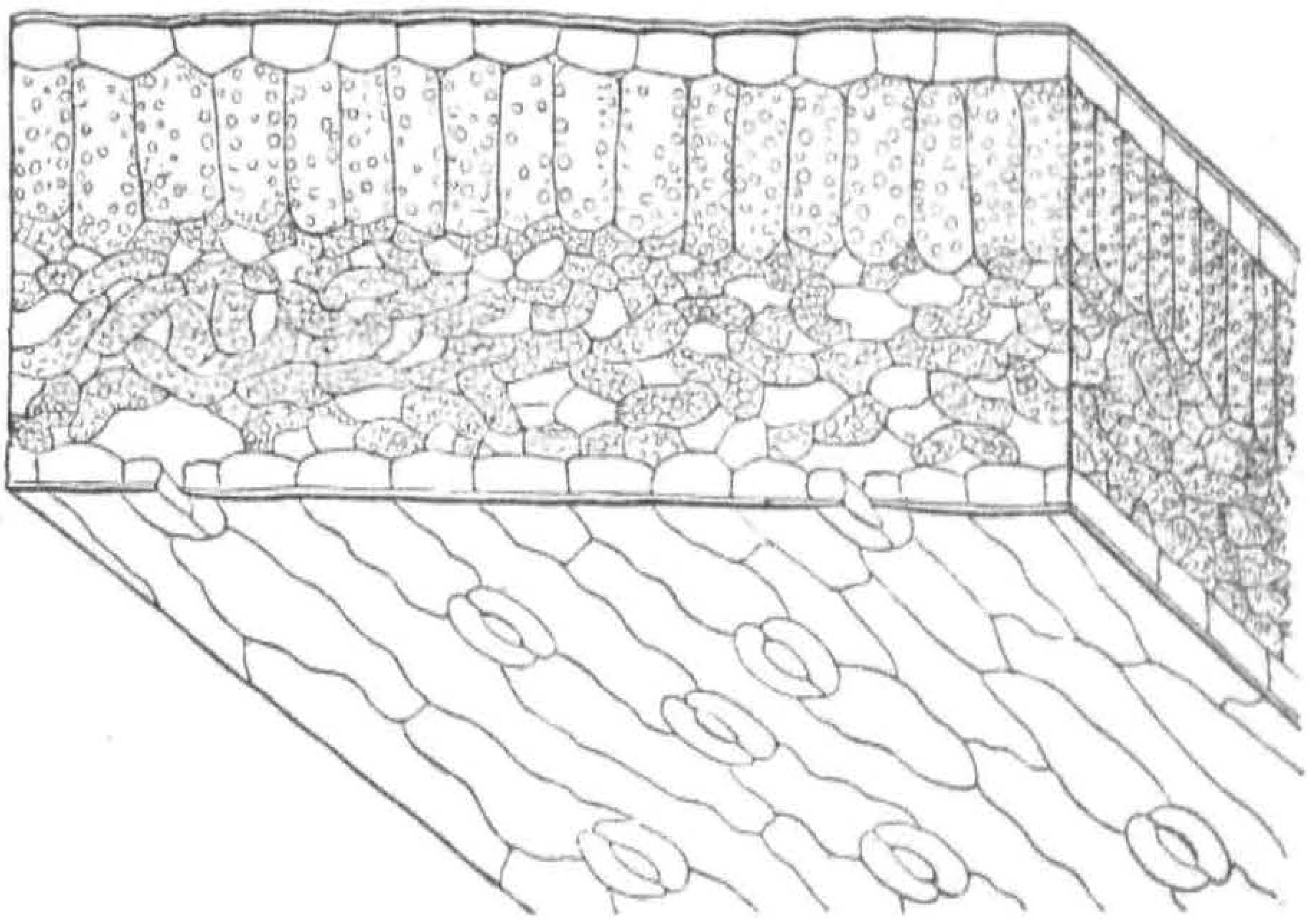
441. That the upper side of the leaf alone is so constructed as to bear the sunshine, is shown by what happens when their position is reversed: then the leaf soon twists on its stalk, so as to turn again its under surface away from the light; and when prevented from doing so, it perishes.

442. A large part of the moisture which the roots of a growing plant are constantly absorbing, after being carried up through the stem, is evaporated from the leaves. A Sunflower-plant, a little over three feet high, and with between five and six thousand square inches of surface in foliage, &c., has been found to exhale twenty or thirty ounces (between one and two pints) of water in a day. Some part of this, no doubt, flies off through the walls of the epidermis or skin, at least in sunshine and dry weather; but no considerable portion of it. The very object of this skin is to restrain evaporation. The greater part of the moisture exhaled escapes from the leaf through the

443. **Stomates or Breathing-pores.** These are small openings through the epidermis into the air-chambers, establishing a direct communication between the whole interior of the leaf and the external air. Through these the vapor of water and air can freely escape, or enter, as the case may be. The aperture is guarded by a pair of thin-walled cells, — resembling those of the green pulp within, — which open when moist so as to allow exhalation to go on, but promptly close when dry, so as to arrest it before the interior of the leaf is injured by the dryness.

444. Like the air-chambers, the breathing-pores belong mainly to the under side of the leaf. In the White Lily, — where they are unusually large, and easily seen by a simple microscope of moderate power, — there are about 60,000 to the square inch on the epidermis of the lower surface of the leaf, and only about 3,000 in

the same space of the upper surface. More commonly there are few or none on the upper side; direct sunshine evidently being unfavorable to their operation. Their immense numbers make up for their minuteness. They are said to vary from less than 1,000 to 170,000 to the square inch of surface. In the Apple-tree, where they are under the average as to number, there are about 24,000 to the square inch of the lower surface; so that each leaf has not far from 100,000 of these openings or mouths.



357

LESSON XXVI.

THE PLANT IN ACTION, DOING THE WORK OF VEGETATION.

445. BEING now acquainted with the machinery of the plant, we naturally proceed to inquire what the use of it is, and how it works.

446. It has already been stated, in the first of these Lessons (7), that the great work of plants is *to change inorganic into organic matter*; that is, to take portions of earth and air, — of mineral matter, — upon which animals cannot live at all, and to convert them

FIG. 357. Portion of a White-Lily leaf, cut through and magnified, showing a section of the thickness, and also a part of the skin of the lower side, with some breathing-pores.

into something upon which they can live, namely, into food. All the food of all animals is produced by plants. Animals live upon vegetables; and vegetables live upon earth and air, principally upon the air.

447. **Plants feed upon Earth and Air.** This is evident enough from the way in which they live. Many plants will flourish in pure sand or powdered chalk, or on the bare face of a rock or wall, watered merely with rain-water. And almost any plant may be made to grow from the seed in pure sand, and increase its weight many times, even if it will not come to perfection. Many naturally live suspended from the branches of trees high in the air, and nourished by it alone, never having any connection with the soil (81); and some which naturally grow on the ground, like the Live-for-ever of the gardens, when pulled up by the roots and hung in the air will often flourish the whole summer long.

448. It is true that fast-growing plants, or those which produce considerable vegetable matter in one season, — especially in such a concentrated form as to be useful as food for man or the higher animals, — will come to maturity only in an enriched soil. But what is a rich soil? One which contains decomposing vegetable matter, or some decomposing animal matter; that is, in either case, some decomposing organic matter formerly produced by plants; aided by this, grain-bearing and other important vegetables will grow more rapidly and vigorously, and make a greater amount of nourishing matter, than they could if left to do the whole work at once from the beginning. So that in these cases also all the organic matter was made by plants, and made out of earth and air.

449. **Their Chemical Composition shows what Plants are made of.** The soil and the air in which plants live, and by which they are everywhere surrounded, supply a variety of materials, some likely to be useful to the plant, others not. To know what elements the plant makes use of, we must first know of what its fabric and its products are composed.

450. We may distinguish two sorts of materials in plants, one of which is absolutely essential, and is the same in all of them; the other, also to some extent essential, but very variable in different plants, or in the same plant under different circumstances. The former is the *organic*, the latter the *inorganic* or *earthy* materials.

451. **The Earthy or Inorganic Constituents.** If we burn thoroughly a leaf, a piece of wood, or any other part of a vegetable, almost all of

it is dissipated into air. But a little ashes remain: these represent the earthy constituents of the plant.

452. They consist of some *potash* (or *soda* if a marine plant was used), some *silex* (the same as flint), and probably a little *lime*, *alumine*, or *magnesia*, *iron* or *manganese*, *sulphur* or *phosphorus*, &c. Some or all of these elements may be detected in many or most plants. But they make no part of their real fabric; and they form only from one or two to nine or ten parts out of a hundred of any vegetable substance. The ashes vary according to the nature of the soil. In fact, they consist, principally, of such materials as happened to be dissolved, in small quantity, in the water which was taken up by the roots; and when that is consumed by the plant, or flies off pure (as it largely does, 447) by exhalation, the earthy matter is left behind in the cells, —just as it is left incrusting the sides of a teakettle in which much hard water has been boiled. As is very natural, therefore, we find more earthy matter (i. e. more ashes) in the leaves than in any other part (sometimes as much as seven per cent, when the wood contains only two per cent); because it is through the leaves that most of the water escapes from the plant. These earthy constituents are often useful to the plant (the silex, for instance, increases the strength of the Wheat-stalk), or are useful in the plant's products as furnishing needful elements in the food of man and other animals; and some must be held to be necessary to vegetation, since this is never known to go on without them.

453. **The Organic Constituents.** As has just been remarked, when we burn in the open air a piece of any plant, nearly its whole bulk, and from 88 to more than 99 parts out of a hundred by weight of its substance, disappear, being turned into air and vapor. These are the *organic constituents* which have thus been consumed, — the actual materials of the cells and the whole real fabric of the plant. And we may state that, in burning, it has been decomposed into exactly the same kinds of air, and the vapor of water, that the plant used in its making. The burning has merely undone the work of vegetation, and given back the materials to the air just in the state in which the plant took them.

454. It will not be difficult to understand what the organic constituents, that is, what the real materials, of the plant are, and how the plant obtains them. The substance of which vegetable tissue, viz. the wall of the cells, is made, is by chemists named *Cellulose*. It is just the same thing in composition in wood and in soft cellular tis-

sue, — in the tender pot-herb and in the oldest tree. It is composed of carbon, hydrogen, and oxygen, 12 parts of the former to 10 of each of the two latter. These, accordingly, are necessary materials of vegetable growth, and must be received by the growing plant.

455. **The Plant's Food** must contain these three elements in some shape or other. Let us look for them in the materials which the plant is constantly taking from the soil and the air.

456. *Water* is the substance of which it takes in vastly more than of anything else: we well know how necessary it is to vegetable life. The plant imbibes water by the roots, which are specially constructed for taking it in, as a liquid when the soil is wet, and probably also in the form of vapor when the soil is only damp. That water in the form of vapor is absorbed by the leaves likewise, when the plant needs it, is evident from the way partly wilted leaves revive and freshen when sprinkled or placed in a moist atmosphere. Now water is composed of *hydrogen* and *oxygen*, two of the three elements of cellulose or plant-fabric. Moreover, the hydrogen and the oxygen exist in water in exactly the same proportions that they do in cellulose: so it is clear that water furnishes these two elements.

457. We inquire, therefore, after the third element, *carbon*. This is the same as pure charcoal. Charcoal is the carbon of a vegetable left behind after charring, that is, heating it out of contact of the air until the hydrogen and oxygen are driven off. The charcoal of wood is so abundant in bulk as to preserve perfectly the shape of the cells after charring, and in weight it amounts to about half that of the original material. Carbon itself is a solid, and not at all dissolved by water: as such, therefore, it cannot be absorbed into the plant, however minute the particles; only liquid and air can pass through the walls of the cells (402, 410). It must therefore come to the plant in some combination, and in a fluid form. The only substance within the plant's reach containing carbon in the proper state is

458. *Carbonic Acid.* This is a gas, and one of the components of the atmosphere, everywhere making about $\frac{1}{2500}$ part of its bulk, — enough for the food of plants, but not enough to be injurious to animals. For when mixed in any considerable proportion with the air we breathe, carbonic acid is very poisonous. The air produced by burning charcoal is carbonic acid, and we know how soon burning charcoal in a close room will destroy life.

459. The air around us consists, besides this minute proportion of carbonic acid, of two other gases, mixed together, viz. *oxygen*

and *nitrogen*. The nitrogen gas does not support animal life: it only dilutes the oxygen, which does. It is the oxygen gas alone which renders the air fit for breathing.

460. Carbonic acid consists of carbon combined with oxygen. In breathing, animals are constantly forming carbonic acid gas by uniting carbon from their bodies with oxygen of the air; they inspire oxygen into their lungs; they breath it out as carbonic acid. So with every breath animals are diminishing the oxygen of the air,— so necessary to animal life,— and are increasing its carbonic acid,— so hurtful to animal life; or rather, which would be so hurtful if it were allowed to accumulate in the air. The reason why it does not increase in the air beyond this minute proportion is that plants feed upon it. They draw their whole stock of carbon from the carbonic acid of the air.

461. Plants take it in by their leaves. Every current, or breeze that stirs the foliage, brings to every leaf a succession of fresh atoms of carbonic acid, which it absorbs through its thousands of breathing-pores. We may prove this very easily, by putting a small plant or a fresh leafy bough into a glass globe, exposed to sunshine, and having two openings, causing air mixed with a known proportion of carbonic acid gas to enter by one opening, slowly traverse the foliage, and pass out by the other into a vessel proper to receive it: now, examining the air chemically, it will be found to have less carbonic acid than before. A portion has been taken up by the foliage.

462. Plants also take it in by their roots, some probably as a gas, in the same way that leaves absorb it, and much, certainly, dissolved in the water which the rootlets imbibe. The air in the soil, especially in a rich soil, contains many times as much carbonic acid as an equal bulk of the atmosphere above. Decomposing vegetable matter or manures, in the soil, are constantly evolving carbonic acid, and a large part of it remains there, in the pores and crevices, among which the absorbing rootlets spread and ramify. Besides, as this gas is dissolved by water in a moderate degree, every rain-drop that falls from the clouds to the ground brings with it a little carbonic acid, dissolving or washing it out of the air as it passes, and bringing it down to the roots of plants. And what flows off into the streams and ponds serves for the food of water-plants.

463. So water and carbonic acid, taken in by the leaves, or taken in by the roots and carried up to the leaves as crude sap, are the general food of plants,— are the raw materials out of which at least

the fabric and a part of the general products of the plant are made. Water and carbonic acid are *mineral matters:* in the plant, mainly in the foliage, they are changed into *organic matters.* This is

464. **The Plant's proper Work, Assimilation,** viz. the conversion by the vegetable of foreign, dead, mineral matter into its own living substance, or into organic matter capable of becoming living substance. To do this is, as we have said, the peculiar office of the plant. How and where is it done?

465. *It is done in the green parts of plants alone, and only when these are acted upon by the light of the sun.* The sun in some way supplies a power which enables the living plant to originate these peculiar chemical combinations, — to organize matter into forms which are alone capable of being endowed with life. The proof of this proposition is simple; and it shows at the same time, in the simplest way, what the plant does with the water and carbonic acid it consumes. Namely, 1st, it is only in sunshine or bright daylight that the green parts of plants give out oxygen gas, — then they do; and 2d, the giving out of this oxygen gas is just what is required to render the chemical composition of water and carbonic acid the same as that of *cellulose* (454), that is, of the plant's fabric. This shows why plants spread out so large a surface of foliage.

466. In plants growing or placed under water we may see bubbles of air rising from the foliage; we may collect enough of this air to test it by a candle's burning brighter in it; which shows it to be oxygen gas. Now if the plant is making cellulose or plant-substance, — that is, is making the very materials of its fabric and growth, as must generally be the case, — all this oxygen gas given off by the leaves comes from the decomposition of carbonic acid taken in by the plant.

467. This *must be so*, because cellulose is composed of 10 parts of xygen and 10 of hydrogen to 12 of carbon (454): here the first wo are just in the same proportions as in water, which consists of ne part of oxygen and one of hydrogen, — so that 10 parts of water id 12 of carbon represent one of cellulose or plant-fabric; and to ake it out of water and carbonic acid, the latter (which is composed carbon and oxygen) has only to give up all its oxygen. In other ords, the plant, in its foliage under sunshine, decomposes carbonic id gas, and turns the carbon together with water into cellulose, at same time giving the oxygen off into the air.

468. And we can readily prove that it is so, — namely, that plants

do decompose carbonic acid in their leaves and give out its oxygen, — by the experiment mentioned in paragraph 461. There the leaves, as we have stated, are taking in carbonic acid gas. We now add, that they are giving out oxygen gas at the same rate. The air as it comes from the glass globe is found to have just as much more oxygen as it has less carbonic acid than before — just as much more oxygen as would be required to turn the carbon retained in the plant back into carbonic acid again.

469. It is all the same when plants — instead of making fabric at once, that is, growing — make the prepared material, and store it up for future use. The principal product of plants for this purpose is *Starch*, which consists of minute grains of organic matter, lying loose in the cells. Plants often accumulate this, perhaps in the root, as in the Turnip, Carrot, and Dahlia (Fig. 57 – 60); or in subterranean stems or branches, as in the Potato (Fig. 68), and many rootstocks; or in the bases of leaves, as in the Onion, Lily (Fig. 73 – 75), and other bulbs; or in fleshy leaves above ground, as those of the Ice-Plant, House-leek, and Century-Plant (Fig. 82); or in the whole thickened body, as in many Cactuses (Fig. 76); or in the seed around the embryo, as in Indian Corn (Fig. 38, 39) and other grain; or even in the embryo itself, as in the Horsechestnut (Fig. 23, 24), Bean (Fig. 16), Pea (Fig. 19), &c. In all these forms this is a provision for future growth, either of the plant itself or of some offset from it, or of its offspring, as it springs from the seed. Now starch is to cellulose or vegetable fabric just what the prepared clay is to the potter's vessel, — the same thing, only requiring to be shaped and consolidated. It has exactly the same chemical composition, and is equally made of carbon and the elements of water, by decomposing the same amount of carbonic acid and giving back its oxygen to the air. In using it for growth, the plant dissolves it, conveys it to the growing parts, and consolidates it into fabric.

470. *Sugar*, another principal vegetable product, also has essentially the same chemical composition, and may be formed out of the same common food of plants, with the same result. The different kinds of sugar (that of the cane, &c. and of grapes) consist of the same three materials as starch and cellulose, only with a little more water. The plant generally forms the sugar out of starch, changing one into the other with great ease; starch being the form in which prepared material is stored up, and sugar that in which it is ex-

pended or transferred from one part of the plant to another. In the Sugar-cane and Indian Corn, starch is deposited in the seed; in germination this is turned into sugar for the plantlet to begin its growth with; the growing plant produces more, and deposits some as starch in the stalk; just before blossoming, this is changed into sugar again, and dissolved in the sap, to form and feed the flowers (which cannot, like the leaves, create nourishment for themselves); and what is left is deposited in the seed as starch again, with which to begin the same operation in the next generation.

471. We might enumerate other vegetable products of this class (such as oil, acids, jelly, the pulp of fruits, &c.), and show how they are formed out of the carbonic acid and water which the plant takes in. But those already mentioned are sufficient. In producing any of them, carbonic acid taken from the air is decomposed, its carbon retained, and its oxygen given back to the air. That is to say,

472. **Plants purify the Air for Animals**, by taking away the carbonic acid injurious to them, continually poured into it by their breathing, as well as by the burning of fuel and by decay, and restoring in its place an equal bulk of life-sustaining oxygen (460). And by the same operation, combining this carbon with the elements of water, &c., and elaborating them into organic matter, — especially into starch, sugar, oil, and the like, —

473. **Plants produce all the Food and Fabric of Animals.** The herbivorous animals feed directly upon vegetables; and the carnivorous eed upon the herbivorous. Neither the one nor the other originate ny organic matter. They take it all ready-made from plants, — ltering the form and qualities more or less, and at length destroyg or decomposing it.

474. Starch, sugar, and oil, for example, form a large part of the od of herbivorous animals and of man. When digested, they enter to the blood; any surplus may be stored up for a time in the form fat, being changed a little in its nature; while the rest (and finally e whole) is decomposed into carbonic acid and water, and exhaled m the lungs in respiration; — in other words, is given back to the by the animal as the very same materials which the plant takes m the air as its food (463); — is given back to the air in the same m that it would have been if the vegetable matter had been left decay where it grew, or if it had been set on fire and burned; — l with the same result too as to the heat, the heat in this case ducing and maintaining the proper temperature of the animal

475. But starch, sugar, and the like, do not make any part of the flesh or fabric of animals. And that for the obvious reason, that they consist of only the three elements *carbon*, *hydrogen*, and *oxygen*; whereas the flesh of animals has nitrogen as well as these three elements in its composition. The materials of the animal body, called *Fibrine* in the flesh or muscles, *Gelatine* in the sinews and bones, *Caseine* in the curd of milk, &c., are all forms of one and the same substance, composed of *carbon*, *hydrogen*, *oxygen*, and *nitrogen*. As nitrogen is a large constituent of the atmosphere, and animals are taking it into their lungs with every breath they draw, we might suppose that they take this element of their frame directly from the air. But they do not. Even this is furnished by vegetables, and animals receive it ready-made in their food. And this brings us to consider still another and most important vegetable product, of a different class from the rest (omitted till now, for the sake of greater simplicity); namely, what is called

476. *Proteine.* This name has been given to it by chemists, because it occurs under such a protean variety of forms. The *Gluten* of wheat and the *Legumine* of beans and other leguminous plants may be taken to represent it. It occurs in all plants, at least in young and growing parts. It does not make any portion of their tissue, but is contained in all living cells, as a thin jelly, mingled with the sap or juice, or as a delicate mucilaginous lining. In fact, it is formed earlier than the cell-wall itself, and the latter is moulded on it, as it were; so it is also called *Protoplasm*. It disappears from common cells as they grow old, being transferred onward to new or forming parts, where it plays a very active part in growth. Mixed with starch, &c., it is accumulated in considerable quantity in wheat, beans, and other grains and seeds, especially those which are most nutritious as food. It is the proteine which makes them so nutritious. Taken by animals as food, it forms their flesh and sinews, and the animal part of their bones, without much change; for it has the same composition, — is just the same thing, indeed, in some slightly different forms. To produce it, the plant employs, in addition to the carbonic acid and water already mentioned as its general food, some *ammonia;* which is a compound of *hydrogen* and *nitrogen*. Ammonia (which is the same thing as hartshorn) is constantly escaping into the air in small quantities from all decomposing vegetable and animal substances. Besides, it is produced in every thunderstorm. Every flash of lightning causes some to be made (in the

form of *nitrate of ammonia*) out of the nitrogen of the air and the vapor of water. The reason why it never accumulates in the air so as to be perceptible is, that it is extremely soluble in water, as are all its compounds. So it is washed out of the atmosphere by the rain as fast as it is made or rises into it, and is brought down to the roots of plants, which take it in freely. When assimilated in the leaves along with carbon and water, proteine is formed, the very substance of the flesh of animals. So all flesh is vegetable matter in its origin.

477. Even the earthy matter of the bones, and the iron and other mineral matters in the blood of animals, are derived from the plants they feed upon, with hardly an exception. These are furnished by the earthy or mineral constituents of plants (452), and are merely accumulated in the animal frame.

478. Animals, therefore, depend absolutely upon vegetables for their being. The great object for which the All-wise Creator established the vegetable kingdom evidently is, that plants might stand on the surface of the earth between the mineral and the animal creations, and organize portions of the former for the sustenance of the latter.

LESSON XXVII.

PLANT-LIFE.

479. LIFE is known to us only by its effects. We cannot tell what it *is*; but we notice some things which it *does*. One peculiarity of living things, which has been illustrated in the last Lesson, is their power of transforming matter into new forms, and thereby making products never produced in any other way. Life is also manifested by

480. **Motion**, that is, by self-caused movements. Living things move; those not living are moved. Animals, living as they do upon organized food, — which is not found everywhere, — must needs have the power of going after it, of collecting it, or at least of taking it in; which requires them to make spontaneous movements. But plants, with their wide-spread surface (34, 131) always in con-

tact with the earth and air on which they feed, — the latter and the most important of these everywhere just the same, — have no need of locomotion, and so are generally fixed fast to the spot where they grow.

481. Yet many plants move their parts freely, sometimes when there is no occasion for it that we can understand, and sometimes accomplishing by it some useful end. The sudden closing of the leaflets of the Sensitive Plant, and the dropping of its leafstalk, when jarred, also the sudden starting forwards of the stamens of the Barberry at the touch, are familiar examples. Such cases seem at first view so strange, and so different from what we expect of a plant, that these plants are generally imagined to be endowed with a peculiar faculty, denied to common vegetables. But a closer examination will show that plants generally share in this faculty; that similar movements may be detected in them all, only — like those of the hands of a clock, or of the shadow of a sun-dial — they are too slow for the motion to be directly seen.

482. It is perfectly evident, also, that growth requires motion; that there is always an internal activity in living plants as well as in animals, — a power exerted which causes their fluids to move or circulate, and carries materials from one part to another. Some movements are mechanical; but even these are generally directed or controlled by the plant. Others must be as truly self-caused as those of animals are. Let us glance at some of the principal sorts, and see what light they throw upon vegetable life.

483. **Circulation in Cells.** From what we know of the anatomy of plants, it is clear that they have no general circulation (like that of all animals except the lowest), through a system of vessels opening into each other (402, 410). But in plants each living cell carries on a circulation of its own, at least when young and active. This may be beautifully seen in the transparent stems of Chara and many other water-plants, and in the leaves of the Fresh-water Tape-Grass (Vallisneria), under a good microscope. Here the sap circulates, often quite briskly in appearance, (but the motion is magnified as well as the objects,) in a steady stream, just beneath the wall, around each cell, passing up one side, across the end, down the other, and so round to complete the circuit, carrying with it small particles, or the larger green grains, which make the current more visible. This circulation may also be observed in hairs, particularly those on flowers, such as the jointed hairs of Spiderwort, looking

under the glass like strings of blue beads, each bead being a cell. But here a microscope magnifying six or eight hundred times in diameter is needed to see the current distinctly.

484. The movement belongs to the *protoplasm* (476), or jelly-like matter under the cell-wall. As this substance has just the same composition as the flesh of animals, it is not so strange that it should exhibit such animal-like characters. In the simplest water-plants, of the Sea-weed family, the body which answers to the seed is at first only a rounded little mass of protoplasm. When these bodies escape from the mother plant, they often swim about freely in the water in various directions, by a truly spontaneous motion, when they closely resemble animalcules, and are often mistaken for them. After enjoying this active life for several hours, they come to rest, form a covering of cellulose, and therefore become true vegetable cells, fix themselves to some support, germinate, and grow into the perfect plant.

485. **Absorption, Conveyance of the Sap, &c.** Although contained in cells with closed walls, nevertheless the fluids taken in by the roots are carried up through the stem to the leaves even of the topmost bough of the tallest tree. And the sap, after its assimilation by the leaves, is carried down in the bark or the cambium-layer, and distributed throughout the plant, or else is conveyed to the points where growth is taking place, or is accumulated in roots, stems, or wherever a deposit is being stored up for future use (71, 104, 128, 469).

486. That the rise of the sap is pretty rapid in a leafy and growing plant, on a dry summer's day, is evident from the amount of water it is continually losing by exhalation from the foliage (447); — a loss which must all the while be supplied from the roots, or else the leaves would dry up and die; as they do so promptly when separated from the stem, or when the stem is cut off from the roots. Of course they do not then lose moisture any faster than they did before the separation; only the supply is no longer kept up from below.

487. The rise of the sap into the leaves apparently is to a great degree the result of a mode of diffusion which has been called *Endosmose.* It acts in this way. Whenever two fluids of different density are separated by a membrane, whether of dead or of living substance, or are separated by any porous partition, a flow takes place through the partition, mainly towards the heavier fluid, until that is brought to the same density as the other. A familiar illus-

tration is seen when we place powdered sugar upon strawberries, and slightly moisten them: the dissolving sugar makes a solution stronger than the juice in the cells of the fruit; so this is gradually drawn out. Also when pulpy fruits are boiled in a strong sirup; as soon as the sirup becomes denser than the juice in the fruit, the latter begins to flow out and the fruit begins to shrivel. But when shrivelled fruits are placed in weak sirup, or in water, they become plump, because the flow then sets inwards, the juice in the cells being denser than the water outside. Now the cells of the living plant contain organic matter, in the form of mucilage, protoplasm, sometimes sugar, &c.; and this particularly abounds in young and growing parts, such as the tips of roots (Fig. 56), which, as is well known, are the principal agents in absorbing moisture from the ground. The contents of their cells being therefore always much denser than the moisture outside (which is water containing a little carbonic acid, &c., and a very minute quantity of earthy matter), this moisture is constantly drawn into the root. What makes it ascend to the leaves?

488. To answer this question, we must look to the leaves, and consider what is going on there. For (however it may be in the spring before the leaves are out), in a leafy plant or tree the sap is not forced up from below, but is drawn up from above. Water largely evaporates from the leaves (447); it flies off into the air as vapor, leaving behind all the earthy and the organic matters, — these not being volatile; — the sap in the cells of the leaf therefore becomes denser, and so draws upon the more watery contents of the cells of the stalk, these upon those of the stem below, and so on, from cell to cell down to the root, causing a flow from the roots to the leaves, which begins in the latter, — just as a wind begins in the direction towards which it blows. Somewhat similarly, elaborated sap is drawn into buds or any growing parts, where it is consolidated into fabric, or is conveyed into tubers, roots, seeds, and the like, in which it is condensed into starch and stored up for future use (74, 103, &c.).

489. So in absorbing moisture by the roots, and in conveying the sap or the juices from cell to cell and from one part to another, the plant appears to make use of a physical or inorganic force; but it manages and directs this as the purposes of the vegetable economy demand. Now, when the proper materials are brought to the growing parts, *growth* takes place; and in growth the plant moves

under the glass like strings of blue beads, each bead being a cell. But here a microscope magnifying six or eight hundred times in diameter is needed to see the current distinctly.

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the particles of matter, arranges them, and shapes the fabric in a manner which we cannot at all explain by any mechanical laws. The organs are not shaped by any external forces; they shape themselves, and take such forms and positions as the nature of each part, or the kind of plant, requires.

490. **Special Movements.** Besides growing, and quite independent of it, plants not only assume particular positions, but move or bend one part upon another to do so. Almost every species does this, as well as what are called sensitive plants. In springing from the seed, the radicle or stem of the embryo, if not in the proper position already, bends itself round so as to direct its root-end downwards, and the stem-end or plumule upwards. It does the same when covered so deeply by the soil that no light can affect it, or when growing in a perfectly dark cellar. But after reaching the light, the stem bends towards that, as every one knows; and bends towards the stronger light, when the two sides are unequally exposed to the sun. It is now known that the shoot is bent by the shortening of the cells on the more illuminated side; for if we split the bending shoot in two, that side curves over still more, while the opposite side inclines to fly back. But how the light causes the cells to shorten on that side, we can no more explain, than we can tell how the will, acting through the nerves, causes the contraction of the fibres of the muscles by which a man bends his arm. We are sure that the bending of the shoot has nothing to do with growth, because it takes place after a shoot is grown; and the delicate stem of a young seedling will bend a thousand times faster than it grows. Also because it is yellow light that most favors growth and the formation of vegetable fabric, while the blue and violet rays produce the bending. Leaves also move, even more freely than stems. They constantly present their upper face to the light; and when turned upside down, they twist on their stalks, or curve round to recover their original position. The free ends of twining stems, as of Hop, or Morning Glory, or Bean, which apparently hang over to one side from their weight, are in fact bent over, and, the direction of the bend constantly changing, the shoot is steadily sweeping round the circle, making a revolution every few hours, or even more rapidly in certain cases, until it reaches a neighboring support, when, by a continuation of the same movement, it twines around it. Most tendrils revolve in the same way, sometimes even more rapidly; while others only turn from the

light; this is especially the case with those that cling to walls or trunks by sucker-like disks, as Virginia Creeper, p. 38, fig. 62. When an active tendril comes into contact with a stem or any such extraneous body, it incurves at the point of contact, and so lays hold of the support: the same contraction or tendency to curve affecting the whole length of the tendril, it soon shortens into a coil, part coiling one way, part the other, thus drawing the shoot up to the supporting body; or, if the tendril be free, it winds up in a simple coil. This movement of tendrils is so prompt in the Star-Cucumber (Sicyos) in Echinocystis, and in two sorts of Passion-flower, that the end, after a gentle rubbing, coils up by a movement rapid enough to be readily seen. In plants that climb by their leaf-stalks, such as Maurandia and Tropæolum, the movements are similar, but much too slow to be seen.

491. The so-called *sleep of plants* is a change of position as night draws on, and in different ways, according to the species, — the Locust and Wood-Sorrel turning down their leaflets, the Honey Locust raising them upright, the Sensitive Plant turning them forwards one over another; and the next morning they resume their diurnal position. One fact, among others, showing that the changes are not *caused* by the light, but by some power in the plant itself, is this. The leaves of the Sensitive Plant close long before sunset; but they expand again before sunrise, under much less light than they had when they closed. In several plants the leaves take the nocturnal position when brushed or jarred, — in the common Sensitive Plant very suddenly, in other sorts less quickly, in the Honey Locust a little too slowly for us to see the motion. The way in which blossoms open and close, some when the light increases, some when it diminishes, illustrates the same thing. The stamens of the Barberry, when touched at the base on the inner side, — as by an insect seeking for honey, or by the point of a pin, — make a sudden jerk forward, and in the process commonly throw some pollen upon the stigma, which stands a little above their reach.

492. In many of these cases we plainly perceive that a useful end is subserved. But what shall we say of the Venus's Fly-trap of North Carolina, growing where it might be sure of all the food a plant can need, yet provided with an apparatus for catching insects, and actually capturing them expertly by a sudden motion, in the manner already described (126, Fig. 81)? Or of the leaflets of the

Desmodium gyrans of the East Indies, spontaneously falling and *rising by turns in jerking motions nearly the whole day long?* We can only say, that plants are alive, no less than animals, and that it is a characteristic of living things to move.

*** Cryptogamous or Flowerless Plants.

493. In all the foregoing Lessons, we have had what may be called plants of the higher classes alone in view. There are others, composing the lower grades of vegetation, to which some allusion ought to be made.

494. Of this sort are Ferns or Brakes, Mosses, Liverworts, Lichens, Sea-weeds, and Fungi or Mushrooms. They are all classed together under the name of *Flowerless Plants*, or *Cryptogamous Plants;* the former epithet referring to the fact that they do not bear real *blossoms* (with stamens and pistils) nor *seeds* (with an embryo ready-formed within). Instead of seeds they have *spores*, which are usually simple cells (392). The name *Cryptogamous* means, of hidden fructification, and intimates that they may have something answering to stamens and pistils, although not the same; and this is now known to be the ca-e with most of them.

495. Flowerless plants are so very various, and so peculiar in each family, that a volume would be required to illustrate them. Curious and attractive as they are, they are too difficult to be studied botanically by the beginner, except the Ferns, Club-Mosses, and Horse-tails. For the study of these we refer the student at once to the *Manual of the Botany of the Northern United States*, and to the *Field, Forest, and Garden Botany.* The structure and physiology of these plants, as well as of the Mosses, Liverworts, Lichens, Sea-weeds, and Fungi, are explained in the *Structural Botany, or Botanical Text-Book*, and in other similar works. When the student has become prepared for the study, nothing can be more interesting than these plants of the lowest orders.

LESSON XXVIII.

SPECIES AND KINDS.

496. UNTIL now, we have been considering plants as to their structure and their mode of life. We have, as it were, been reading the biography of an individual plant, following it from the tiny seedling up to the mature and fruit-bearing herb or tree, and learning how it grows and what it does. The botanist also considers *plants as to their relationships.*

497. Plants and animals, as is well known, have two great peculiarities: 1st, they form themselves; and 2d, they multiply themselves. They reproduce themselves in a continued succession of

498. **Individuals** (3). Mineral things occur as *masses*, which are divisible into smaller and still smaller ones without alteration of their properties (391). But organic things (vegetables and animals) exist as *individual beings.* Each owes its existence to a parent, and produces similar individuals in its turn. So each individual is a link of a chain; and to this chain the natural-historian applies the name of

499. **Species.** All the descendants from the same stock therefore compose one species. And it was from our observing that the several sorts of plants or animals steadily reproduce themselves,— or, in other words, keep up a succession of similar individuals,— that the idea of species originated. So we are led to conclude that the Creator established a definite number of species at the beginning, which have continued by propagation, each after its kind.

500. There are few species, however, in which man has actually observed the succession for many generations. It could seldom be proved that all the White Pine trees or White Oaks of any forest came from the same stock. But observation having familiarized us with the general fact, that individuals proceeding from the same stock are essentially alike, we infer from their close resemblance that these similar individuals belong to the same species. That is, we infer it when the individuals are as much like each other as those are which we know to have sprung from the same stock.

501. We do not infer it from every resemblance; for there is the resemblance of *kind*,— as between the White Oak and the Red Oak.

and between the latter and the Scarlet Oak: these, we take for granted, have not originated from one and the same stock, but from three separate stocks. Nor do we deny it on account of every difference; for even the sheep of the same flock, and the plants raised from peas of the same pod, may show differences, and such differences occasionally get to be very striking. When they are pretty well marked, we call them

Varieties. The White Oak, for example, presents two or three varieties in the shape of the leaves, although they may be all alike upon each particular tree. The question often arises, practically, and it is often hard to answer, whether the difference in a particular case is that of a variety, or is specific. If the former, we may commonly prove it to be so by finding such intermediate degrees of difference in various individuals as to show that no clear line of distinction can be drawn between them; or else by observing the variety to vary back again, if not in the same individual, yet in its offspring. Our sorts of Apples, Pears, Potatoes, and the like, show us that differences which are permanent in the individual, and continue unchanged through a long series of generations when propagated by division (as by offsets, cuttings, grafts, bulbs, tubers, &c.), are not likely to be reproduced by seed. Still they sometimes are so: and such varieties are called

Races. These are strongly marked varieties, capable of being propagated by seed. Our different sorts of Wheat, Indian Corn, Peas, Radishes, &c., are familiar examples: and the races of men offer an analogous instance.

502. It should be noted, that all varieties have a *tendency* to be reproduced by seed, just as all the peculiarities of the parent tend to be reproduced in the offspring. And by selecting those plants which have developed or inherited any desirable peculiarity, keeping them from mingling with their less promising brethren, and selecting again the most promising plants raised from their seeds, we may in a few generations render almost any variety transmissible by seed, so long as we take good care of it. In fact, this is the way the cultivated or domesticated races, so useful to man, have been fixed and preserved. Races, in fact, can hardly, if at all, be said to exist independently of man. But man does not really produce them. Such peculiarities — often surprising enough — now and then originate, we know not how (the plant *sports*, as the gardeners say); they are only preserved, propagated, and generally further developed, by the culti-

vator's skilful care. If left alone, they are likely to dwindle and perish, or else revert to the original form of the species.

503. Botanists variously estimate the number of known species of plants at from seventy to one hundred thousand. About 3,850 species of the higher classes grow wild in the United States east of the Mississippi. So that the vegetable kingdom exhibits a very great diversity. Between our largest and highest-organized trees, such as a Magnolia or an Oak, and the simplest of plants, reduced to a single cell or sphere, much too minute to be visible to the naked eye, how wide the difference! Yet the extremes are connected by intermediate grades of every sort, so as to leave no wide gap at any place; and not only so, but every grade, from the most complex to the most simple, is exhibited under a wide and most beautiful diversity of forms, all based upon the one plan of vegetation which we have been studying, and so connected and so answering to each other throughout as to convince the thoughtful botanist that all are parts of one system, works of one hand, realizations in nature of the conception of One Mind. We perceive this, also, by the way in which the species are grouped into

504. **Kinds.** If the species, when arranged according to their resemblances, were found to differ from one another about equally, — that is, if No. 1 differed from No. 2 just as much as No. 2 did from No. 3, and No. 4 from No. 5, and so on throughout, — then, with all the diversity in the vegetable kingdom there is now, there would yet be no foundation in nature for grouping species into kinds. Species and kinds would mean just the same thing. We should classify them, no doubt, for convenience, but our classification would be arbitrary. The fact is, however, that species resemble each other in very unequal degrees. Some species are almost exactly alike in their whole structure, and differ only in the shape or proportion of their parts; these, we say, belong to one *Genus*. Some, again, show a more general resemblance, and are found to have their flowers and seeds constructed on the same particular plan, but with important differences in the details; these belong to the same *Order* or *Family*. Then, taking a wider survey, we perceive that they all group themselves under a few general types (or patterns), distinguishable at once by their flowers, by their seeds or embryos, by the character of the seedling plant, by the structure of their stems and leaves, and by their general appearance: these great groups we call *Classes*. Finally, we distinguish the whole into two great types or grades;

the higher grade of Flowering plants, exhibiting the full plan of vegetation, and the lower grade of Flowerless plants, in which vegetation is so simplified that at length the only likeness between them and our common trees or Flowering plants is that they are both vegetables. From species, then, we rise first to

505. **Genera** (plural of *Genus*). The Rose kind or genus, the Oak genus, the Chestnut genus, &c., are familiar illustrations. Each genus is a group of *nearly related species, exhibiting a particular plan*. All the Oaks belong to one genus, the Chestnuts to another, the Beech to a third. The Apple, Pear, and Crab are species of one genus, the Quince represents another, the various species of Hawthorn a third. In the animal kingdom the common cat, the wild cat, the panther, the tiger, the leopard, and the lion are species of the cat kind or genus; while the dog, the jackal, the different species of wolf, and the foxes, compose another genus. Some genera are represented by a vast *number of species, others by few, very many by only one* known species. For the genus may be as perfectly represented in one species as in several, although, if this were the case throughout, genera and *species would of course be identical* (504). The Beech genus and the Chestnut genus would be just as distinct from the Oak genus even if but one Beech and one Chestnut were known; as indeed was the case formerly.

506. **Orders or Families** (the two names are used for the same thing in botany) are *groups of genera that resemble each other; that is, they are to genera what genera are to species*. As familiar illustrations, the Oak, Chestnut, and Beech genera, along with the Hazel genus and the Hornbeams, all belong to one order, viz. the Oak Family; the Birches and the Alders make another family; the Poplars and Willows, another; the Walnuts (with the Butternut) and the Hickories, another. The Apple genus, the Quince and the Hawthorns, along with the Plums and Cherries and the Peach, the Raspberry, with the Blackberry, the Strawberry, the Rose, and many other genera, belong to a large order, the Rose Family.

507. **Tribes and Suborders.** This leads us to remark, that even the genera of the same order may show very unequal degrees of resemblance. Some may be very closely related to one another, and at the *same time differ strikingly from the rest in certain important partic*ulars. In the Rose Family, for example, there is the Rose genus itself, with the Raspberry genus, the Strawberry, the Cinquefoil, &c. near it, but by no means so much like it as they are like each

other: this group, therefore, answers to what is called a *Tribe;* and the Rose itself stands for another tribe. But we further observe that the Apple genus, the Hawthorns, the Quince, and the June-berry, though of the same order, and nearly related among themselves, differ yet more widely from the Rose and its nearest relations; and so, on the other hand, do the Plum and Cherry, the Peach and the Almond. So this great Rose Family, or Order, is composed of three groups, of a more marked character than tribes, — groups which might naturally be taken for orders; and we call them *Suborders.* But students will understand these matters best after a few lessons in studying plants in a work describing the kinds.

508. **Classes.** These are great assemblages of orders, as already explained (515). The orders of Flowering Plants are numerous, no less than 134 being represented in the Botany of the Northern United States; but they all group themselves under two great classes. One class comprises all that have seeds with a monocotyledonous embryo (32), endogenous stems (423), and generally parallel-veined leaves (139); the other, those with dicotyledonous embryo, exogenous stems, and netted-veined leaves; and the whole aspect of the two is so different that they are known at a glance.

509. Finally, these two classes together compose the upper *Series* or grade of *Flowering or Phænogamous Plants,* which have their counterpart in the lower *Series* of *Flowerless or Cryptogamous Plants,* — composed of three classes, and about a dozen orders.

510. The universal members of classification are CLASS, ORDER, GENUS, SPECIES, always standing in this order. When there are more, they take their places as in the following schedule, which comprises all that are generally used in a natural classification, proceeding from the highest to the lowest, viz.: —

Series,
- CLASS,
  - Subclass,
    - ORDER, or FAMILY,
      - Suborder,
        - Tribe,
          - Subtribe,
            - GENUS,
              - Subgenus or Section,
                - SPECIES,
                  - Variety.

LESSON XXIX.

BOTANICAL NAMES AND CHARACTERS.

511. PLANTS are *classified*, — i. e. are marshalled under their respective classes, orders, tribes, genera, and species, — and they are *characterized*, — that is, their principal characteristics or distinguishing marks are described or enumerated, in order that,

First, their resemblances or differences, of various degrees, may be clearly exhibited, and all the species and kinds ranked next to those they are most related to; — and

Secondly, that students may readily ascertain the botanical names of the plants they meet with, and learn their peculiarities, properties, and place in the system.

512. It is in the latter that the young student is chiefly interested. And by his studies in this regard he is gradually led up to a higher point of view, from which he may take an intelligent survey of the whole general system of plants. But the best way for the student to learn the classification of plants (or Botany as a system), is to use it, in finding out by it the name and the peculiarities of all the wild plants he meets with.

513. **Names.** The botanical name of a plant, that by which a botanist designates it, is the name of its genus followed by that of the species. The name of the genus or kind is like the family name or surname of a person, as *Smith*, or *Jones*. That of the species answers to the baptismal name, as *John*, or *James*. Accordingly, the White Oak is called botanically *Quercus alba*; the first word, or *Quercus*, being the name of the Oak genus; the second, *alba*, that of this particular species. And the Red Oak is named *Quercus rubra*; the Black-Jack Oak, *Quercus nigra*; and so on. The botanical names are all in Latin (or are Latinized), this being the common language of science everywhere; and, according to the usage of that language, and of most others, the name of the species comes after that of the genus, while in English it comes before it.

514. **Generic Names.** A plant, then, is named by two words. The generic name, or that of the genus, is one word, and a substantive. Commonly it is the old classical name, when the genus was known to the Greeks and Romans; as *Quercus* for the Oak, *Fagus* for the

Beech, *Córylus*, the Hazel, and the like. But as more genera became known, botanists had new names to make or borrow. Many are named from some appearance or property of the flowers, leaves, or other parts of the plant. To take a few examples from the early pages of the *Manual of the Botany of the Northern United States*,— in which the derivation of the generic names is explained. The genus *Hepatica*, p. 6, comes from the shape of the leaf resembling that of the liver. *Myosurus*, p. 10, means mouse-tail. *Delphinium*, p. 12, is from delphin, a dolphin, and alludes to the shape of the flower, which was thought to resemble the classical figures of the dolphin. *Zanthorhiza*, p. 13, is from two Greek words meaning yellow-root, the common name of the plant. *Cimicifuga*, p. 14, is formed of two Latin words, meaning, to drive away bugs, the same as its common name of Bugbane, the Siberian species being used to keep away such vermin. *Sanguinaria*, p. 26, is named from the blood-like color of its juice.

515. Other genera are dedicated to distinguished botanists or promoters of natural science, and bear their names: such are *Magnolia*, p. 15, which commemorates the early French botanist, Magnol, and *Jeffersonia*, p. 20, named after President Jefferson, who sent the first exploring expedition over the Rocky Mountains. Others bear the name of the discoverer of the plant in question; as, *Sarracenia*, p. 23, dedicated to Dr. Sarrazin of Quebec, who was one of the first to send our common Pitcher-plant to the botanists of Europe; and *Claytonia*, p. 65, first made known by the early Virginian botanist Clayton.

516.° **Specific Names.** The name of the species is also a single word, appended to that of the genus. It is commonly an adjective, and therefore agrees with the generic name in case, gender, &c. Sometimes it relates to the country the species inhabits; as, Claytonia *Virginica*, first made known from Virginia; Sanguinaria *Canadensis*, from Canada, &c. More commonly it denotes some obvious or characteristic trait of the species; as, for example, in Sarracenia, our northern species is named *purpurea*, from the purple blossoms, while a more southern one is named *flava*, because its petals are yellow; the species of Jeffersonia is called *diphylla*, meaning two-leaved, because its leaf is divided into two leaflets. Some species are named after the discoverer, or in compliment to a botanist who has made them known; as, Magnolia *Fraseri*, named after the botanist Fraser, one of the first to find this species; Ra-

worthia *Michauxii*, p. 65, named for the early botanist Michaux; and Polygala *Nuttallii*, in compliment to Mr. Nuttall, who described it under another name. Such names of persons are of course written with a capital initial letter. Occasionally some old substantive name is used for the species; as Magnolia *Umbrella*, p. 49, and Ranunculus *Flammula*, p. 41. These are also written with a capital initial, and need not accord with the generic name in gender, &c.

517. The name of a variety, when it is distinct enough to require any, is made on the same plan as that of the species, and is written after it; as, Ranunculus Flammula, variety *reptans*, p. 41 (i. e. the creeping variety), and R. abortivus, variety *micranthus*, p. 42, or the small-flowered variety of this species.

518. **Names of Groups.** The names of tribes, orders, and the like, are in the plural number, and are commonly formed by prolonging the name of a genus of the group taken as a representative of it. For example, the order of which the Buttercup or Crowfoot genus, *Ranunculus*, is the representative, takes from it the name of *Ranunculaceæ* (Manual, p. 34); meaning *Plantæ Ranunculaceæ* when written out in full, that is, Ranunculaceous Plants. This order comprises several tribes; one of which, to which Ranunculus itself belongs, takes the name of *Ranunculeæ;* another, to which the genus *Clematis*, or the Virgin's-Bower, belongs, takes accordingly the name of *Clematideæ;* and so on. So the term *Rosaceæ* (meaning Rosaceous plants) is the name of the order of which the Rose (*Rosa*) is the well-known representative; and *Roseæ* is the name of the particular tribe of it which comprises the Rose.

519. A few orders are named on a somewhat different plan. The great order *Leguminosæ*, for instance (Manual, p. 123), is not named after any genus in it; but the fruit, which is a legume (356), gives the name of *Leguminous Plants*. So, likewise, the order *Umbelliferæ* (Manual, p. 187) means Umbelliferous or Umbel-bearing Plants; and the vast order *Compositæ* (Manual, p. 215) is so named because it consists of plants whose blossoms are crowded into heads of the sort which were called "compound flowers" by the old botanists (277).

520. **Characters.** The brief description, or enumeration in scientific terms, of the principal distinctive marks of a species, genus, order, or other group, as given in botanical works, is called its *Character*. Thus, in the Manual, already referred to, at the begin-

ning, the character of the first great series is given; then that of the first class, of the first subclass, and of the first division under it. Then, after the name of the order, follows its character (the *ordinal* character): under the name of each genus (as, 1. *Clematis*, p. 35) is added the *generic* character, or description of what essentially distinguishes it; and finally, following the name of each species, is the *specific* character, a succinct enumeration of the points in which it mainly differs from other species of the same genus. See, for illustration, *Clematis Viorna*, p. 36, where the sentence immediately following the name is intended to characterize that species from all others like it.

521. Under this genus, and generally where we have several species of a genus, the species are arranged under *sections*, and these often under *subsections*, for the student's convenience in analysis, — the character or description of a section applying to all the species under it, and therefore not having to be repeated under each species. Under Clematis, also, are two sections with names, or sub-genera, which indicates that they might almost be regarded as two distinct genera. But these details are best understood by practice, in the actual studying of plants to ascertain their name and place. And to this the student is now ready to proceed.

LESSON XXX.

HOW TO STUDY PLANTS.

522. Having explained, in the two preceding Lessons, the general principles of Classification, and of Botanical Names, we may now show, by a few examples, how the student is to proceed in applying them, and how the name and the place in the system of an unknown plant are to be ascertained.

523. We suppose the student to be provided with a hand *magnifying-glass*, and, if possible, with a *simple microscope*, i. e. with a magnifying-glass, of two or more different powers, mounted on a support, over a stage, holding a glass plate, on which small flowers or their parts may be laid, while they are dissected under the microscope with the points of needles (mounted in handles), or divided

by a sharp knife. Such a microscope is not *necessary*, except for very small flowers; but it is a great convenience at all times, and is indispensable in studying the more difficult orders of plants.

524. We suppose the student now to have a work in which the plants of the country or district are scientifically arranged and described: if in the Southern Atlantic States, Dr. Chapman's *Flora of the Southern States;* if north of Carolina and Tennessee, Gray's *Manual of the Botany of the United States*, fifth edition; or, as covering the whole ground as to common plants, and including also all the common cultivated plants, Gray's *Field, Forest, and Garden Botany*, which is particularly arranged as the companion of the present work; that containing brief botanical descriptions of the plants, and this the explanation of their general structure, and of the technical terms employed in describing them. To express clearly the distinctions which botanists observe, and which furnish the best marks to know a plant by, requires a good many technical terms, or words used with a precise meaning. These, as they are met with, the student should look out in the Glossary at the end of this volume. The terms in common use are not so numerous as they would at first appear to be. With practice they will soon become so familiar as to give very little trouble. And the application of botanical descriptive language to the plants themselves, indicating all their varieties of form and structure, is an excellent discipline for the mind, equal, if not in some respects superior, to that of learning a classical language.

525. The following illustrations and explanations of the way to use the descriptive work are, first, for The *Field, Forest, and Garden Botany*, that being the one which will be generally used by beginners and classes. This and the *Lessons*, bound together in a single compact volume, will serve the whole purpose of all but advanced students, teachers, and working botanists. Thus equipped, we proceed to

526. **The Analysis of a Plant.** A Buttercup will serve as well as any. Some species or other may be found in blossom throughout nearly the whole spring and summer; and, except at the very beginning of the season, the fruit, more or less developed, may be gathered with the blossom. To a full knowledge of a plant the fruit is essential, although the name may almost always be ascertained without it. This common yellow flower being under examination, we are to refer the plant to its proper class and order or

family. The families are so numerous, and so generally distinguishable only by a combination of a considerable number of marks that the student must find his way to them by means of a contrivance called an *Analytical Key*. This Key begins on p. 12.

527. It takes note of the most comprehensive possible division of plants, namely those "producing true flowers and seeds," and those "not producing flowers, propagated by spores." To the first of these, the great series of PHÆNOGAMOUS or FLOWERING PLANTS, the plant under examination obviously belongs.

528. This series divides into those "with wood in a circle, or in concentric annual circles or layers around a central pith, netted-veined leaves, and parts of the flower mostly in fives or fours," — to which might be added the dicotyledonous embryo, but that in the present case is beyond the young student's powers, even if the fruit were at hand; — and into those "with wood in separate threads scattered through the diameter of the stem, not in a circle," also the "leaves mostly parallel-veined, and parts of the flower almost always in threes, never in fives." Although the hollowness of the stem of the present plant may obscure its internal structure, a practised hand, by throwing the light through a thin cross section of the stem under the glass, would make it evident that its woody bundles were all in a circle near the circumference, yet this could hardly be expected of an unassisted and inexperienced beginner. But the two other and very obvious marks, the netted-veined leaves, and the number five in both calyx and corolla, certify at once that the plant belongs to the first class, EXOGENOUS or DICOTYLEDONOUS PLANTS.

529. We should now look at the flower more particularly, so as to make out its general plan of structure, which we shall need to know all about as we go on. We observe that it has a calyx of 5 sepals, though these are apt to fall soon after the blossom opens; that the 5 petals are borne on the receptacle (or common axis of the flower) just above the sepals and alternate with them; that there are next borne, a

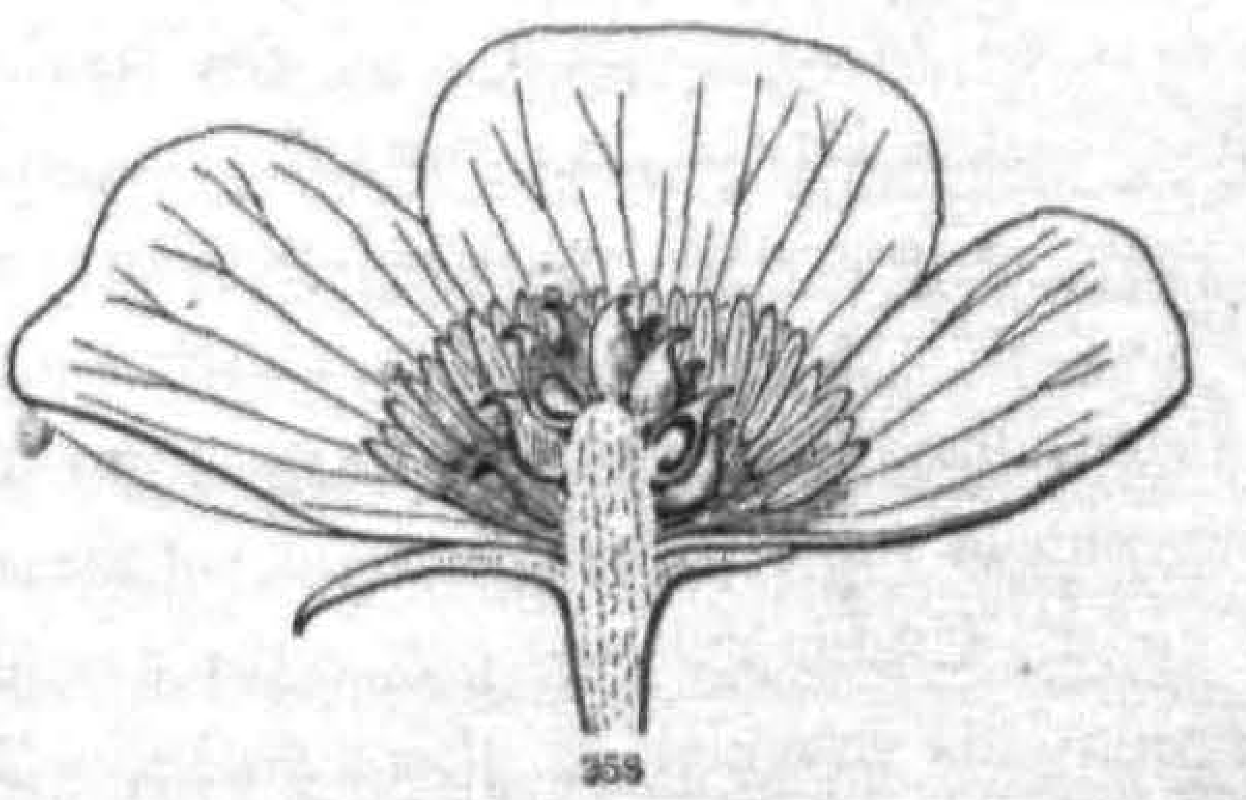
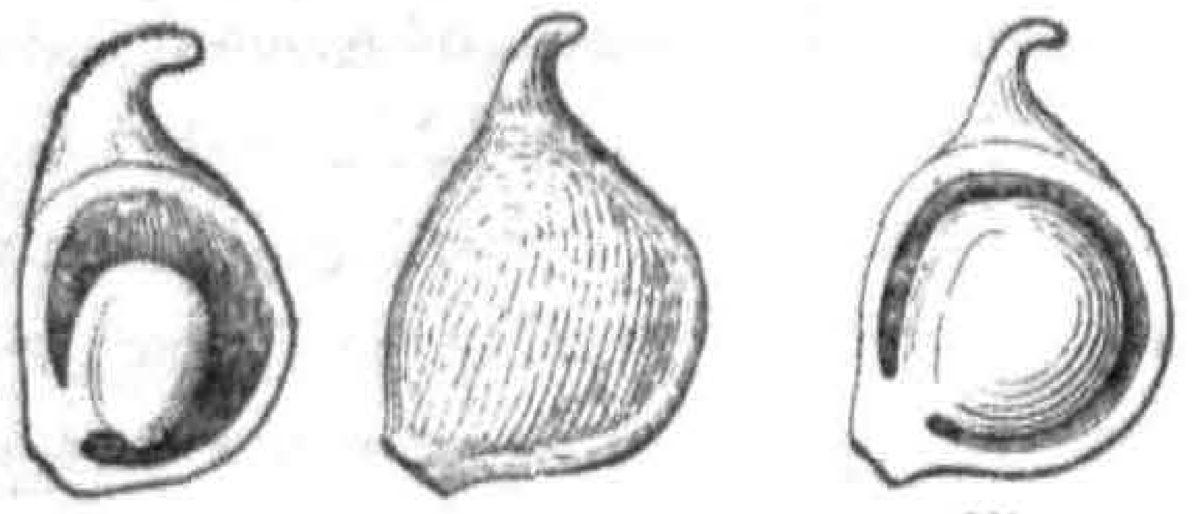

358

FIG. 358. A flower of a Buttercup (Ranunculus bulbosus) cut through from top to bottom, and enlarged.

little higher up on the receptacle, an indefinite number of stamens; and, lastly, covering the summit or centre of the receptacle, an indefinite number of pistils. A good view of the whole is to be had by cutting the flower directly through the middle, from top to bottom (Fig. 358). If this be done



359 360 361

with a sharp knife, some of the pistils will be neatly divided, or may be so by a second slicing. Each pistil, we see, is a closed ovary, containing a single ovule (Fig. 359) ascending from near the base of the cell, and is tipped with a very short broad style, which has the stigma running down the whole length of its inner edge. The ovary is little changed as it ripens into the sort of fruit termed an *akene* (Fig. 360); the ovule becoming the seed and fitting the cell (Fig. 361). Reverting to the key, on p. 13, we find that the class to which our plant belongs has two subclasses, one "with pistil of the ordinary sort, the ovules in a closed ovary"; the other "without proper pistil, the ovules naked on a scale," &c. The latter is nearly restricted to the Pine Family. The examination already had makes it quite clear that our plant belongs to the first subclass, ANGIOSPERMOUS Exogenous or Dicotyledonous Plants.

530. We have here no less than 110 orders under this subclass. To aid the unpractised student in finding his way among them, they are ranked under three artificial divisions; the *Polypetalous*, the *Monopetalous*, and the *Apetalous*. The plant in hand being furnished, in the words of the key, "with both calyx and corolla, the latter of wholly separate petals," is to be sought under I. POLYPETALOUS DIVISION; for the analysis of which, see p. 14.

531. Fully half the families of the class rank under this division. The first step in the key is to the sections A and B; to the first of which, having "stamens more than 10, and more than twice the number of the sepals or divisions of the calyx," our plant must pertain.

532. Under this we proceed by a series of successive steps, their gradations marked by their position on the page, leading down to the name of the order or family, to which is appended the number

FIG. 359. A pistil taken from a Buttercup (Ranunculus bulbosus), and more magnified; its ovary cut through lengthwise, showing the ovule. 360. One of its pistils when ripened into a fruit (*achenium* or *akene*). 361. The same, cut through, to show the seed in it.

of the page where that family and the plants under it are described. The propositions of the same grade, two or more, from which determination is to be made, not only stand one directly under the other, but begin with the same word or phrase, or with some counterpart, — in the present case again with "Stamens," and with four propositions, with one and only one of which the flower in hand should agree. It agrees with the last of the four: "Stamens not monadelphous."

533. The propositions under this, to which we are now directed, are six, beginning with the word "Pistils" or "Pistil." The one which applies to the flower in hand is, clearly, the fourth: "Pistils numerous or more than one, separate, on the receptacle."

534. The terms of the analysis directly subordinate to this are only two: we have to choose between "Stamens borne on the calyx," and "Stamens borne on the receptacle." The latter is true of our flower. The terms subordinate to this are four, beginning with the word "Leaves." The fourth alone accords: "Leaves not peltate; herbs," — and this line leads out to the CROWFOOT FAMILY, and refers to p. 33.

535. Turning to that page, a perusal of the brief account of the marks of the RANUNCULACEÆ (the technical Latin name) or CROWFOOT FAMILY, assures us that the Key has led us safely and readily to a correct result. Knowing the order or family, we have next to ascertain the genus. Here are twenty genera to choose from; but their characters are analyzed under sections and successive subsections (§, *, +, ++, &c.) so as to facilitate the way to the desired result. Of the two primary sections, we must reject § 1, as it agrees only in respect to the pistils, and differs wholly in the characters furnished by the sepals, the petals, and the leaves. With "§ 2. *Sepals imbricated in the bud: not climbing nor woody*," it agrees. It also agrees with the sub-section immediately following, viz.: "* *Pistils and akenes, several or many in a head, one-seeded.*" The subdivision following: "+ *Petals none: sepals petal-like*," is inapplicable; but its counterpart, "+ + *Petals and sepals both conspicuous, five or more: akenes, naked, short-pointed*," suits, and restricts our choice to the three genera, Adonis, Myosurus, and Ranunculus. The determination is soon made, upon noting the naked sepals, the petals with the little scale on the upper face of the short claw, and the akenes in a head: so the genus is, 7. RANUNCULUS.

536. The arrangement of the species of Ranunculus is to be found, under the proper number, 7, on p. 37 and the following. The first section contains aquatic species; ours is terrestrial, and in all other particulars answers to § 2. The smooth ovary and akene, and the perennial root refer it to the subsection following, marked by the single star. The shape of the leaves excludes it from the "+- Spearwort Crowfoots," the large and showy petals from the "+- +- Small-flowered Crowfoots; while all the marks agree with +- +- +- BUTTERCUPS or COMMON CROWFOOTS. There is still a subdivision, one set marked, "++ *Natives of the country, low or spreading*," the other "++ ++ *Introduced weeds from Europe, common in fields, &c.: stem erect: leaves much cut*," — which is the case. We have then only to choose between the two field Crowfoots, and we have supposed the pupil to have in hand the lower, early-flowered one, common at the east, which has a solid bulb or corm at the base of the stem, and displays its golden flowers in spring or earliest summer, and which accordingly answers to the description of RANUNCULUS BULBOSUS, the BULBOUS BUTTERCUP.

537. Later in the season it might have been *R. acris*, the *Tall Buttercup*, or much earlier *R. fascicularis*, or *R. repens*. Having ascertained the genus from any one species, the student would not fail to recognize it again in any other, at a glance.

538. If now, with the same plant in hand, the *Manual* (Fifth edition) be the book used, the process of analysis will be so similar, that a brief indication of the steps may suffice. Here the corresponding Analytical Key, commencing on p. 21, leads similarly to the first Series, Class, Subclass, and Division; — to A, with numerous stamens; 1, with calyx entirely free and separate from the pistil or pistils, thence to the fourth line beginning with the word Pistils; thence to the third of the three subordinate propositions, viz. to "Stamens inserted on the receptacle"; to the second of the succeeding couplet, or "Filaments longer than the anther"; to the second of the next couplet, "Flowers perfect," &c., and to the first of the final couplet, "Leaves not peltate; petals deciduous," — which ends in "RANUNCULACEÆ, 34." This is the technical name of the family, and the page where it is described.

539. Turning to that page we read the general description of that order, particularly the portion at the beginning printed in *italics*, which comprises the more important points. The "Synopsis of the

Genera" which follows is similar to, but more technical than that of the other, more elementary book; and the names of the tribes or natural groups of genera (507) are inserted. The steps of analysis bring the student to the Tribe III. RANUNCULEÆ, and under it to the genus RANUNCULUS. The number prefixed to the name enables the student to turn forward and find the genus, p. 40. The name, scientific and popular, is here followed by a full generic character (520). The primary sections here have names: the plant under examination belongs to "§ 2. RANUNCULUS proper"; and thence is to be traced, through the subdivisions *, + + + +, ++ ++, to the ultimate subdivision *b.*, under which, through a comparison of characters, the student reaches the species R. BULBOSUS, L.

540. The L. at the end of the name is the recognized abbreviation of the name of Linnæus, the botanist who gave it. Then come the common or English names; then the specific character; after this, the station where the plant grows, and the region in which it occurs. This is followed by the time of blossoming (from May to July); and then by some general descriptive remarks. The expression "Nat. from Eu." means that the species is a naturalized emigrant from Europe, and is not original to this country. But all these details are duly explained in the Preface to the *Manual*, which the student who uses that work will need to study.

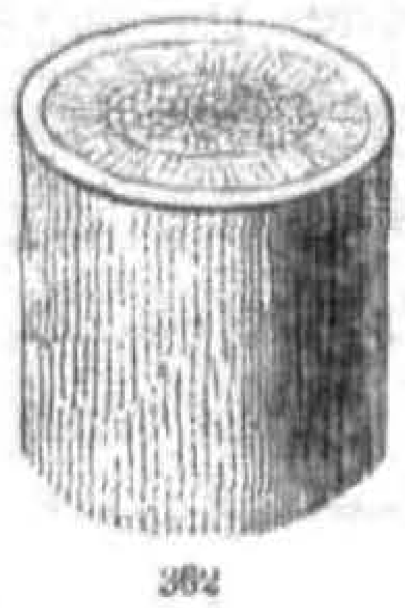
LESSON XXXI.

HOW TO STUDY PLANTS: FURTHER ILLUSTRATIONS.

541. BEGINNERS should not be discouraged by the slow progress they must needs make in the first trials. By perseverance the various difficulties will soon be overcome, and each successful analysis will facilitate the next. Not only will a second species of the same genus be known at a glance, but commonly a second genus of the same order will be recognized as a relative at sight, by the family likeness. Or if the family likeness is not detected at the first view, it will be seen as the characters of the plant are studied out.

542. To help on the student by a second example, we will take the common cultivated Flax. Turning to the Key, as before, on

p. 12, the student is led to ask, first, is the plant PHÆNOGAMOUS or FLOWERING? Of course it is; the blossom, with its stamens and pistils, answers that question. Next, to which of the two classes of Flowering Plants does it belong? If we judge by the stem, we ask whether it is exogenous or endogenous (422–424). A section of the stem, considerably magnified, given on page 151, we may here repeat (Fig. 362); it plainly shows a ring of wood between a central pith and a bark. It is therefore exogenous. Moreover, the leaves are netted-veined, though the veins are not conspicuous. We might even judge from the embryo; for there is little difficulty in dissecting a flax-seed, and in finding that almost the whole interior is occupied by an embryo with two cotyledons, much like that of an apple-seed (Fig. 11, 12), and this class, as one of its name denotes, is dicotyledonous. If we view the parts of the blossom, we perceive they are five throughout (Fig. 363, 365), a number which occurs in that class only. All these marks, or as many of them as the student is able to verify, show that the plant belongs to Class I. EXOGENOUS or DICOTYLEDONOUS PLANTS.

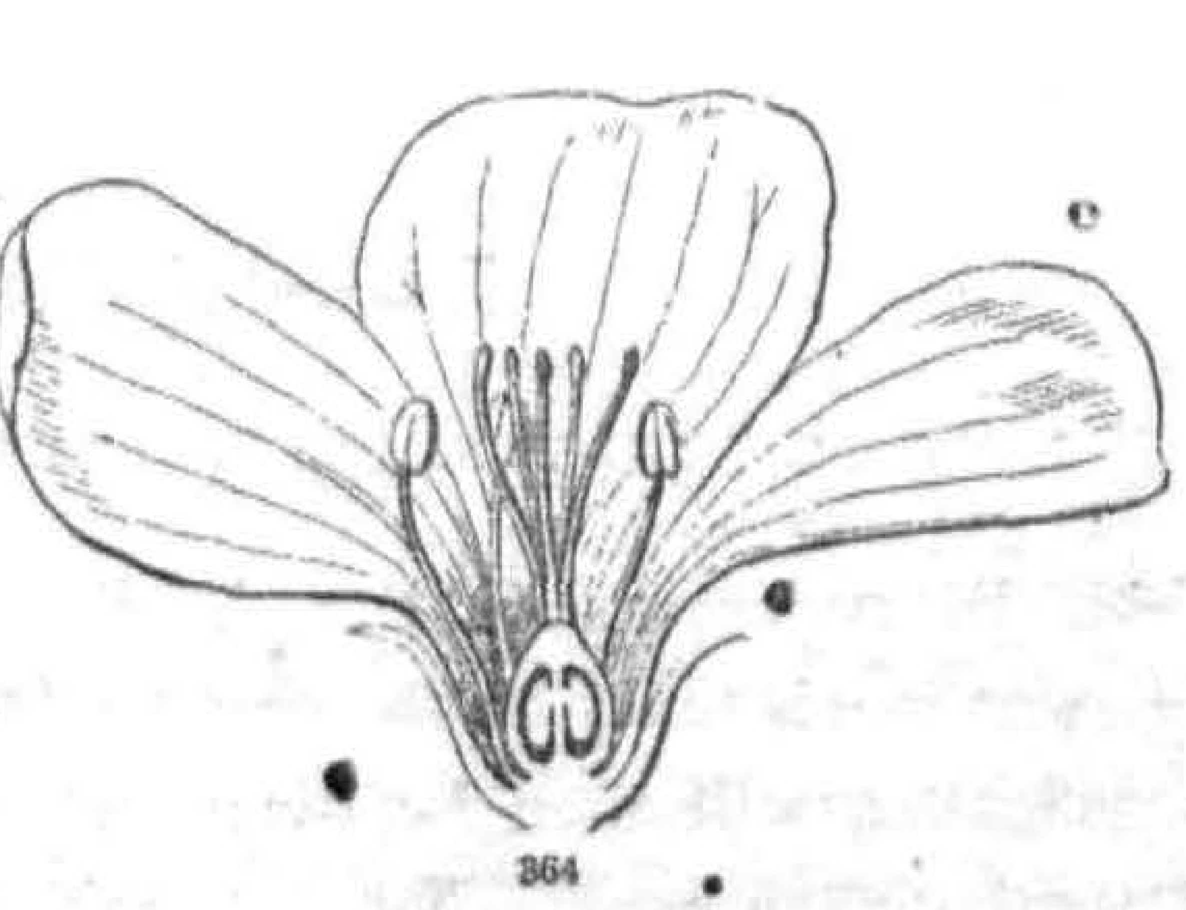


362

543. To which subclass, is the next inquiry. The single but several-celled ovary in the centre of the flower, enclosing the ovules, assures us that it belongs to the ANGIOSPERMOUS subclass, p. 13.

544. To get a good idea of the general plan of the flower, before

363

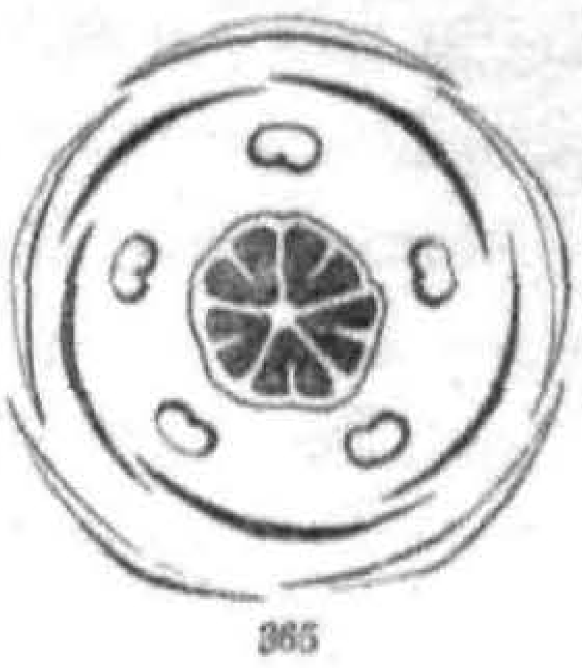


364

proceeding farther, cut it through the middle lengthwise, as in Fig. 364, and also take a slice across a flower-bud, which will bring to view an arrangement somewhat like that of Fig. 365. Evidently the blossom is regularly constructed upon the number five. It has a calyx of five sepals, a corolla of five petals, five stamens, and five

FIG. 362. Section of the stem of Flax, magnified. 363. Summit of a branch of the common Flax, with two flowers. 364. A flower divided lengthwise and enlarged.

styles, with their ovaries all combined into one compound ovary. We note, also, that the several parts of the blossom are all free and unconnected, — the leaves of the calyx, the petals, and the stamens all rising separately one after another from the receptacle underneath the ovary; but the filaments, on close inspection, may show a slight union among themselves, at the base.


365

545. So our plant, having 5 separate petals, is of the POLYPETALOUS division of the first class, for the analysis of which see page 14.

546. But it does not belong to the primary division A, which has more than 10 stamens. The student passes on, therefore, to the counterpart division B, on page 16, to which the few stamens, here only five, refer it.

547. Of the three subdivisions, with numerals prefixed, only the second answers; for the calyx is free from the ovary, and there is only one ovary, although the styles are five.

548. The divisions subordinate to this form a couplet; and our plant agrees with the second member of it, having "Stamens of the same number as the petals" [5] and "alternate with them." The division under this is a triplet, of which we take the third member; for the "Leaves are not punctate with pellucid dots." Under this, in turn, is a triplet beginning with the word Ovary, and the five, if not ten cells, determine our choice of the third member of it, "Ovary compound." Under this we have no less than nine choices, dependent upon the structure of the ovary, the number of ovules and seeds, &c. But the 5-celled ovary with a pair of ovules in each cell, separated by a false partition projecting from the back (Fig. 365), so that the pod becomes in fact 10-celled, with a solitary seed in each cell, is described only in the ninth and last of the set, p. 18. Under this, again, we have to choose among five propositions relating to the seeds. Here the fifth — "Seeds and ovules only one or two in each cell" — alone meets the case. Under this, finally, we have to choose from six lines, beginning with the words Tree, Shrubs, or Herbs. The fifth alone agrees, and leads to the FLAX FAMILY, p. 77.

549. There is only one genus of it in this country, namely, the FLAX genus itself, or LINUM. To determine the species, look first

FIG. 365. Cross-section of an unexpanded flower of the same, a sort of diagram.

at the three sections, marked with stars. The second answers to our plant; and the annual root, pointed sepals, and blue petals determine it to be the COMMON FLAX, LINUM USITATISSIMUM.

550. By the *Manual*, the same plant would be similarly traced, along a somewhat different order of steps, down to the genus on p. 104, and to the species, which being a foreign cultivated one, and only by chance spontaneous, is merely mentioned at the close.

551. After several analyses of this kind, the student will be able to pass rapidly over most of these steps; should ordinarily recognize the class and the division at a glance. Suppose a common Mallow to be the next subject. Having flowers and seeds, it is Phænogamous. The netted-veined leaves, the structure of the stem, and the leaves of the flower in fives, refer it to Class I. The pistils, of the ordinary sort, refer it to Subclass I. The five petals refer it to the Polypetalous division. Turning to the Key in the *Field, Forest, and Garden Botany*, and to the analysis of that division, commencing on p. 14, the numerous stamens fix it upon A, under which the very first line, "Stamens monadelphous, united with the base of the corolla; anthers kidney-shaped, one-celled," exactly expresses the structure of these organs in our plant, which is thus determined to be of the MALLOW FAMILY, — for which see page 70.

552. After reading the character of the family, and noting its agreement in all respects, we fix upon § 1, in which the anthers are all borne at the top, and not down the side of the tube of filaments. We pass the subdivision with a single star, and choose the alternative, with two stars, on account of the ring of ovaries, &c.; fix upon the division +-, on account of the stigmas running down one side of the slender style, instead of forming a little head or blunt tip at their apex; and then have to choose among five genera. The three separate bracts outside of the calyx, the obcordate petals, and the fruit determine the plant to be a MALVA. Then, referring to p. 71 for the species, the small whitish flowers point to the first division, and a comparison of the characters of the two species under it, assures us that the plant in hand is MALVA ROTUNDIFOLIA.

553. For the sake of an example in the Monopetalous Division, we take a sort of Morning-Glory which is often met with climbing over shrubs along the moist banks of streams. Its netted-veined leaves, the sepals and the stamens being five, — also the structure of the stem, if we choose to examine it, and the embryo with two leafy

cotyledons (as in Fig. 26), readily inspected if we have seeds,—show it belongs to Class I. Its pistil refers it of course to Subclass I. The corolla being a short funnel-shaped tube, theoretically regarded as formed of five petals united up to the very summit or border, renders the flower a good illustration of the MONOPETALOUS DIVISION, the analysis of which begins on p. 20, in the work we are using.

554. The calyx free from the ovary excludes it from the section A, and refers it to section B. This is subdivided, in the first place, by the number of the stamens, and their position as respects the lobes of the corolla. Now, as the petals of the corolla in this flower are united up to the very border, the student may at first be puzzled to tell how many lobes it should have, or, in other words, how many petals enter into its composition. But the five leaves of the calyx would lead one to expect a corolla of five parts also. And, although there are here really no lobes or notches to be seen, yet the five plaits of the corolla answer to the notches, and show it to consist of five petals perfectly united. Since the stamens are of the same number as the plaits of the corolla, and are placed before them (as may be best seen by splitting down the corolla on one side and spreading it out flat), it follows that they alternate with the lobes or petals; therefore our plant falls under the third subdivision: "Stamens as many as the lobes or parts of the corolla and alternate with them." This subdivides by the pistils. Our plant, having a pistil with two stigmas and two cells to the ovary, must be referred to the fifth and last category: "Pistil one, with a single compound ovary," &c. We are then directed to the stamens, which here are "plainly borne on the corolla"; next to the leaves, which are on the stem (not all at the root), also alternate, without stipules; the stamens 5, and the ovary 2-celled,—all of which accords with the seventh of the succeeding propositions, and with no other. The middle one alone under this agrees as to the ovary and seeds, and all is confirmed by the twining stem. It is the CONVOLVULUS FAMILY, p. 262.

555. The proper Convolvulus Family has green foliage, as has our plant. Its style is single and entire, as in § 1. Its calyx has a pair of large leafy bracts, as in the subdivision with two stars. So we reach the genus CALYSTEGIA, or BRACTED BINDWEED.

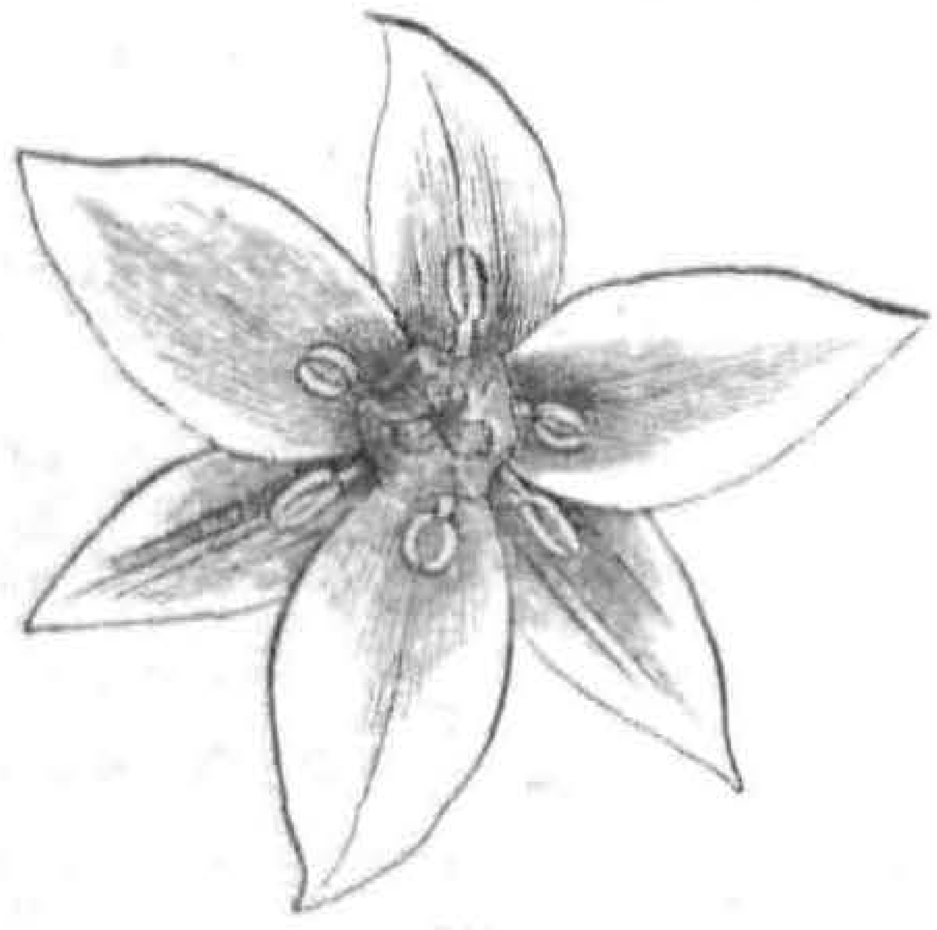
556. Under this genus two species are described: the twining stem, and the other particulars of our plant, direct us to the first C. SEPIUM, which in England is named HEDGE BINDWEED, and here is one of the various Convolvulaceous plants known as MORNING-GLORY.

LESSON XXXII.

HOW TO STUDY PLANTS: FURTHER ILLUSTRATIONS.

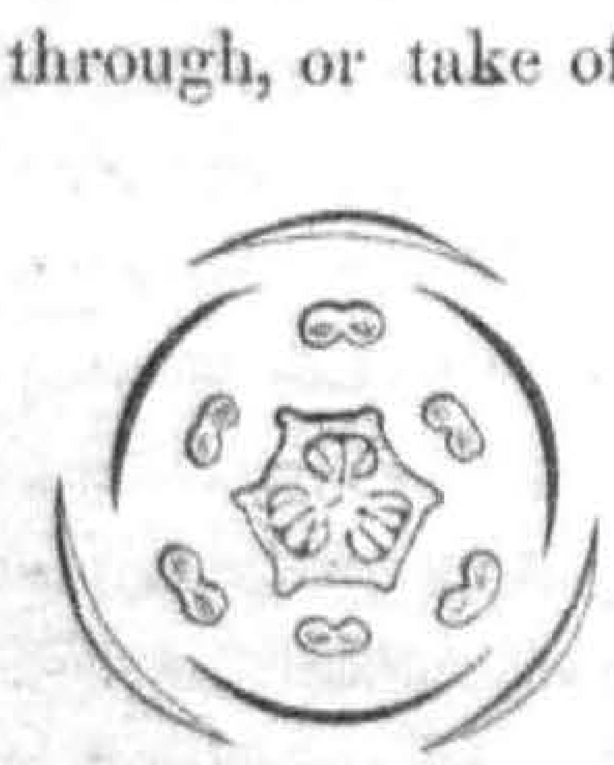
557. THE foregoing illustrations have all been of the first or Exogenous class. We will take one from the other class, and investigate it by the *Manual*.

558. It shall be a rather common plant of our woods in spring, the Three-leaved Nightshade, or Birthroot. With specimens in hand, and the *Manual* open at the Analytical Key, p. 21, seeing that the plant is of the Phænogamous series, we proceed to determine the class. The netted-veined leaves would seem to refer the plant to the first class; while the blossom (Fig. 366, 367), constructed on the number three, naturally directs us to the second



366

class, in which this number almost universally prevails. Here the student will be somewhat puzzled. If the seeds were ripe, they might be examined, to see whether the embryo has one cotyledon only, or a pair. But the seeds are not to be had in spring, and if they were, the embryo would not readily be made out. We must judge, therefore, by the structure of the stem. Is it exogenous or endogenous? If we cut the stem through, or take off a thin slice crosswise and lengthwise, we shall



367

perceive that the woody matter in it consists of a number of threads, interspersed throughout the soft cellular part without regularity, and not collected into a ring or layer. In fact, it is just like the Corn-stalk (Fig. 351), except that the woody threads are fewer. It is therefore *endogenous* (422); and this decides the question in favor of Class II. MONOCOTYLEDONOUS or ENDOGENOUS PLANTS (page 30), notwithstanding the branching veins of the leaves. For neither this character, nor the number of parts in

FIG. 366. Flower of Trillium erectum, viewed from above. 367. Diagram of the same, a cross-section of the unopened blossom, showing the number and arrangement of parts.

the blossom, holds good universally, while the plan of the stem does.

559. The single flower of our plant with distinct calyx and corolla takes us over the Spadiceous to the PETALOIDEOUS DIVISION: the Petaloideous Division of Endogens there begins on p. 28. These parts being free from and beneath the ovary, refer us to the third subdivision, viz: "3. *Perianth wholly free from the ovary.*"

559a. The pistil is next to be considered: it accords with the third of the triplet: "Pistil one, compound (cells or placentæ 3); anthers 2-celled." Under this follows a triplet, of which the initial word is "Perianth": our choice falls upon the first, as there is nothing "glumaceous" about this flower.

560. The succeeding triplet relates to the stamens; here 6, so we take the first alternative. The next refers to mode and place of growth: our plant is "Terrestrial, and not rush-like." The next again to the perianth: the second number of the triplet: "Perianth of 3 foliaceous and green sepals, and 3 colored withering-persistent petals" (as would be seen after flowering-time), brings us to a particular group in the great Lily family, or LILIACEÆ, p. 520.

561. Reading over the family character, and collating the five tribes comprised, we perceive that our plant belongs to the group, quite peculiar among Liliaceous plants, here ranked as Tribe I. TRILLIDEÆ, the Trillium tribe. And the next step, leading to a choice between two genera, determines the genus to be TRILLIUM.

562. Turning to this, on p. 522, and reading the full description of it, we proceed to the easy task of ascertaining the species. The "flower is raised on a peduncle," as in § 2. This peduncle is slender and nearly erect, and all the other particulars accord with the subdivision marked by a single star. And, finally, the ovate, acutish, widely-spreading, dark dull-purple petals mark the species as the PURPLE BIRTHROOT, TRILLIUM ERECTUM, L.

563. By the *Field, Forest, and Garden Botany*, the analysis is similar, only more simple. The details need not be particularly recapitulated.

564. The student residing west of New England will also be likely to find another species, with similar foliage, but with larger, pure white, and obovate petals, turning rose-color when about to fade. This will at once be identified as *T. grandiflorum.* And towards the north, in cold and damp woods or swamps, a smaller

species will be met with, having dull-green and petioled leaves rounded at the base, and rather narrow, wavy, white petals, marked with pink or purple stripes at the base: this the student will refer to *T. erythrocarpum*. But the species principally found in the eastern parts of the country has a short peduncle recurved under the leaves, so as nearly to conceal the much less handsome, dull white flower: this, it will be seen, is *T. cernuum*, the *Nodding Trillium* or *Wake Robin*.

565. Whenever the student has fairly studied out one species of a genus, he will be likely to know the others when he sees them. And when plants of another genus of the same order are met with, the order may generally be recognized at a glance, from the family resemblance. For instance, having first become acquainted with the Convolvulus family in the genus Calystegia (555), we recognize it at once in the common Morning-Glory, and in the Cypress-Vine, and even in the Dodder, although these belong to as many different genera. Having examined the common Mallow (552), we immediately recognize the Mallow family (*Malvaceæ*) in the Marsh-Mallow, sparingly naturalized along the coast, in the Glade Mallow, and the Indian Mallow, in the Hibiscus or Rose-Mallow, and so of the rest: for the relationship is manifest in their general appearance, and in the whole structure of the flowers, if not of the foliage also.

566. So the study of one plant leads naturally and easily to the knowledge of the whole order or family of plants it belongs to:— which is a great advantage, and a vast saving of labor. For, although we have about one hundred and thirty orders of Flowering Plants represented in our Botany of the Northern States by about 2,540 species, yet half of these species belong to nine or ten of these orders; and more than four fifths of the species belong to forty of the orders. One or two hundred species, therefore, well examined, might give a good general idea of our whole botany. And students who will patiently and thoroughly study out twenty or thirty well-chosen examples will afterwards experience little difficulty in determining any of our Flowering Plants and Ferns, and will find the pleasure of the pursuit largely to increase with their increasing knowledge.

567. And the interest will be greatly enhanced as the student, rising to higher and wider views, begins to discern the *System* of Botany, or, in other words, comprehends more and more of *the Plan of the Creator in the Vegetable Kingdom.*

LESSON XXXIII.

BOTANICAL SYSTEMS.

568. **Natural System.** *The System* of Botany consists of the orders or families, duly arranged under their classes, and having the tribes, the genera, and the species arranged in them according to their relationships. This, when properly carried out, is the *Natural System;* because it is intended to express, as well as we are able, the various degrees of relationship among plants, as presented in nature; — to rank those species, those genera, &c. next to each other in the classification which are really most alike in all respects, or, in other words, which are constructed most nearly on the same particular plan.

569. Now this word *plan* of course supposes a *planner*, — an intelligent mind working according to a system: it is this system, therefore, which the botanist is endeavoring as far as he can to exhibit in a classification. In it we humbly attempt to learn something of the plan of the Creator in this department of Nature.

570. So there can be only *one* natural system of Botany, if by the term we mean the plan according to which the vegetable creation was called into being, with all its grades and diversities among the species, as well of past as of the present time. But there may be many natural systems, if we mean the attempts of men to interpret and express the plan of the vegetable creation, — systems which will vary with our advancing knowledge, and with the judgment and skill of different botanists, — and which must all be very imperfect. They will all bear the impress of individual minds, and be shaped by the current philosophy of the age. But the endeavor always is to make the classification a reflection of Nature, as far as any system can be which has to be expressed in a series of definite propositions, and have its divisions and subdivisions following each other in some single fixed order.*

* The best classification must fail to give more than an imperfect and considerably distorted reflection, not merely of the plan of creation, but even of our knowledge of it. It is often obliged to make arbitrary divisions where Nature shows only transitions, and to consider genera, &c. as equal units, or groups of equally related species, while in fact they may be very unequal, — to assume, on

571. The Natural System, as we receive it, and as to that portion of it which is represented in the botany of our country, is laid before the student in the *Manual of the Botany of the Northern United States*. The orders, however, still require to be grouped, according to their natural relationships, into a considerable number of great groups (or *alliances*); but this cannot yet be done throughout in any easy way. So we have merely arranged them somewhat after a customary order, and have given, in the *Artificial Key*, a contrivance for enabling the student easily to find the natural order of any plant. This is a sort of

572. **Artificial Classification.** The object of an artificial classification is merely to furnish a convenient method of finding out the name and place of a plant. It makes no attempt at arranging plants according to their relationships, but serves as a kind of dictionary. It distributes plants according to some one peculiarity or set of peculiarities (just as a dictionary distributes words according to their first letters), disregarding all other considerations.

573. At present we need an artificial classification in Botany only as a Key to the Natural Orders, — as an aid in referring an unknown plant to its proper family; and for this it is very needful to the student. Formerly, when the orders themselves were not clearly made out, an artificial classification was required to lead the student down to the genus. Two such classifications were long in vogue. First, that of Tournefort, founded mainly on the leaves of the flower, the calyx and corolla: this was the prevalent system throughout the first half of the eighteenth century; but it has long since gone by. It was succeeded by the well-known artificial system of Linnæus, which has been used until lately; and which it is still worth while to give some account of.

574. **The Artificial System of Linnæus** was founded on the stamens and pistils. It consists of twenty-four classes, and of a variable number of orders, which were to take the place temporarily of the natural classes and orders; the genera being the same under all classifications.

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paper at least, a strictly definite limitation of genera, of tribes, and of orders, although observation shows so much blending here and there of natural groups, sufficiently distinct on the whole, as to warrant us in assuming the likelihood that the Creator's plan is one of *gradation, not of definite limitation*, even perhaps to the species themselves.

575. The twenty-four *classes* of Linnæus were founded upon something about the stamens. The following is an analysis of them. The first great division is into two great series, the *Phænogamous* and the *Cryptogamous*, the same as in the Natural System. The first of these is divided into those flowers which have the stamens in the same flower with the pistils, and those which have not; and these again are subdivided, as is shown in the following tabular view.

Series I. PHÆNOGAMIA; plants with stamens and pistils, i. e. with real flowers.

1. Stamens in the same flower as the pistils:
  - * Not united with them,
    - ✝ Nor with one another.
      - ✝✝ Of equal length if either 6 or 4 in number.

One to each flower,	Class 1.	MONANDRIA.
Two “ “	2.	DIANDRIA.
Three “ “	3.	TRIANDRIA.
Four “ “	4.	TETRANDRIA.
Five “ “	5.	PENTANDRIA.
Six “ “	6.	HEXANDRIA.
Seven “ “	7.	HEPTANDRIA.
Eight “ “	8.	OCTANDRIA.
Nine “ “	9.	ENNEANDRIA.
Ten “ “	10.	DECANDRIA.
Eleven to nineteen to each flower,	11.	DODECANDRIA.
Twenty or more inserted on the calyx,	12.	ICOSANDRIA.
“ “ “ on the receptacle,	13.	POLYANDRIA.
✝✝ ✝✝ Of unequal length and either 4 or 6.		
Four, 2 long and 2 shorter,	14.	DIDYNAMIA.
Six, 4 long and 2 shorter,	15.	TETRADYNAMIA
✝ ✝ United with each other,		
By their filaments,		
Into one set or tube,	16.	MONADELPHIA.
Into two sets,	17.	DIADELPHIA.
Into three or more sets,	18.	POLYADELPHIA
By their anthers into a ring,	19.	SYNGENESIA.
* * United with the pistil,	20.	GYNANDRIA.
2. Stamens and pistils in separate flowers,		
Of the same individuals,	21.	MONŒCIA.
Of different individuals,	22.	DIŒCIA.
Some flowers perfect, others staminate or pistillate either in the same or in different individuals,	23.	POLYGAMIA.
Series II. CRYPTOGAMIA. No stamens and pistils, therefore no proper flowers,	24.	CRYPTOGAMIA.

576. The names of these classes are all compounded of Greek words. The first eleven consist of the Greek numerals, in succession, from 1 to 11, combined with *andria*, which here denotes stamens; — e. g. *Monandria*, with one stamen; and so on. The 11th has the numeral for twelve stamens, although it includes all which have from eleven to nineteen stamens, numbers which rarely occur. The 12th means "with twenty stamens," but takes in any higher number, although only when the stamens are borne on the calyx. The 13th means "with many stamens," but it takes only those with the stamens borne on the receptacle. The 14th means "two stamens powerful," the shorter pair being supposed to be weaker; the 15th, "four powerful," for the same reason. The names of the next three classes are compounded of *adelphia*, brotherhood, and the Greek words for *one*, *two*, and *many* (*Monadelphia*, *Diadelphia*, and *Polyadelphia*). The 19th means "united in one household." The 20th is compounded of the words for stamens and pistils united. The 21st and 22d are composed of the word meaning *house* and the numerals *one*, or single, and *two*: *Monœcia*, in one house, *Diœcia*, in two houses. The 23d is fancifully formed of the words meaning *plurality* and *marriage*, from which the English word *polygamy* is derived. The 24th is from two words meaning *concealed nuptials*, and is opposed to all the rest, which are called *Phænogamous*, because their stamens and pistils, or parts of fructification, are evident.

577. Having established the classes of his system on the stamens, Linnæus proceeded to divide them into *orders* by marks taken from the pistils, for those of the first thirteen classes. These orders depend on the number of the pistils, or rather on the number of styles, or of stigmas when there are no styles, and they are named, like the classes, by Greek numerals, prefixed to *gynia*, which means *pistil*. Thus, flowers of these thirteen classes with

One style or sessile stigma belong to		Order	1.	MONOGYNIA.
Two styles or sessile stigmas, to			2.	DIGYNIA.
Three	"	"	3.	TRIGYNIA.
Four	"	"	4.	TETRAGYNIA.
Five	"	"	5.	PENTAGYNIA.
Six	"	"	6.	HEXAGYNIA.
Seven	"	"	7.	HEPTAGYNIA.
Eight	"	"	8.	OCTOGYNIA.
Nine	"	"	9.	ENNEAGYNIA.
Ten	"	"	10.	DECAGYNIA.
Eleven or twelve	"		11.	DODECAGYNIA.
More than twelve	"		13.	POLYGYNIA.

578. The orders of the remaining classes are founded on various considerations, some on the nature of the fruit, others on the number and position of the stamens. But there is no need to enumerate them here, nor farther to illustrate the Linnæan Artificial Classification. For as a system it has gone entirely out of use; and as a Key to the Natural Orders it is not so convenient, nor by any means so certain, as a proper Artificial Key, prepared for the purpose, such as we have been using in the preceding Lessons.

LESSON XXXIV.

HOW TO COLLECT SPECIMENS AND MAKE AN HERBARIUM.

579. **For Collecting Specimens** the needful things are a large *knife*, strong enough to be used for digging up bulbs, small rootstocks, and the like, as well as for cutting woody branches; and a *botanical box*, or a *portfolio*, for holding specimens which are to be carried to any distance.

580. It is well to have both. The *botanical box* is most useful for holding specimens which are to be examined fresh. It is made of tin, in shape like a candle-box, only flatter, or the smaller sizes like an English sandwich-case; the lid opening for nearly the whole length of one side of the box. Any portable tin box of convenient size, and capable of holding specimens a foot or fifteen inches long, will answer the purpose. The box should shut close, so that the specimens may not wilt: then it will keep leafy branches and most flowers perfectly fresh for a day or two, especially if slightly moistened.

581. The *portfolio* should be a pretty strong one, from a foot to twenty inches long, and from nine to eleven inches wide, and fastening with tape, or (which is better) by a leathern strap and buckle at the side. It should contain a quantity of sheets of thin and smooth, unsized paper; the poorest printing-paper and grocers' tea-paper are very good for the purpose. The specimens as soon as gathered are to be separately laid in a folded sheet, and kept under moderate pressure in the closed portfolio.

582. Botanical specimens should be either in flower or in fruit. In the case of herbs, the same specimen will often exhibit the two; and both should by all means be secured whenever it is possible. Of small herbs, especially annuals, the whole plant, root and all, should be taken for a specimen. Of larger ones branches will suffice, with some of the leaves from near the root. Enough of the root or subterranean part of the plant should be collected to show whether the plant is an annual, biennial, or perennial. Thick roots, bulbs, tubers, or branches of specimens intended to be preserved, should be thinned with a knife, or cut into slices lengthwise.

583. **For drying Specimens** a good supply of soft and unsized paper — the more bibulous the better — is wanted; and some convenient means of applying pressure. All that is requisite to make good dried botanical specimens is, to dry them as rapidly as possible between many thicknesses of paper to absorb their moisture, under as much pressure as can be given without crushing the more delicate parts. This pressure may be given by a botanical press, of which various forms have been contrived; or by weights placed upon a board, — from forty to eighty or a hundred pounds, according to the quantity of specimens drying at the time. For use while travelling, a good portable press may be made of thick binders' boards for the sides, holding the drying paper, and the pressure may be applied by a cord, or, much better, by strong straps with buckles.

584. For drying paper, the softer and smoother sorts of cheap wrapping-paper answer very well. This paper may be made up into *driers*, each of a dozen sheets or less, according to the thickness, lightly stitched together. Specimens to be dried should be put into the press as soon as possible after gathering. If collected in a portfolio, the more delicate plants should not be disturbed, but the sheets that hold them should one by one be transferred from the portfolio to the press. Specimens brought home in the botanical box must be laid in a folded sheet of the same thin, smooth, and soft paper used in the portfolio; and these sheets are to hold the plants until they are dry. They are to be at once laid in between the driers, and the whole put under pressure. Every day (or at first even twice a day would be well) the specimens, left undisturbed in their sheets, are to be shifted into well-dried fresh driers, and the pressure renewed, while the moist sheets are spread out to dry, that they may take their turn again at the next shifting. This course must be continued until the specimens are no longer moist to the touch, —

which for most plants requires about a week; then they may be transferred to the sheets of paper in which they are to be preserved. If a great abundance of drying-paper is used, it is not necessary to change the sheets every day, after the first day or two.

585. **Herbarium.** The botanist's collection of dried specimens, ticketed with their names, place, and time of collection, and systematically arranged under their genera, orders, &c., forms a *Hortus Siccus* or *Herbarium*. It comprises not only the specimens which the proprietor has himself collected, but those which he acquires through friendly exchanges with distant botanists, or in other ways. The specimens of an herbarium may be kept in folded sheets of neat, and rather thick, white paper; or they may be fastened on half-sheets of such paper, either by slips of gummed paper, or by glue applied to the specimens themselves. Each sheet should be appropriated to one species; two or more different plants should never be attached to the same sheet. The generic and specific name of the plant should be added to the lower right-hand corner, either written on the sheet, or on a ticket pasted down at that corner; and the time of collection, the locality, the color of the flowers, and any other information which the specimens themselves do not afford, should be duly recorded upon the sheet or the ticket. The sheets of the herbarium should all be of exactly the same dimensions. The herbarium of Linnæus is on paper of the common foolscap size, about eleven inches long and seven wide. But this is too small for an herbarium of any magnitude. Sixteen and a half inches by ten and a half, or eleven and a half inches, is an approved size.

586. The sheets containing the species of each genus are to be placed in *genus-covers*, made of a full sheet of thick, colored paper (such as the strongest Manilla-hemp paper), which fold to the same dimensions as the species-sheet; and the name of the genus is to be written on one of the lower corners. These are to be arranged under the orders to which they belong, and the whole kept in closed cases or cabinets, either laid flat in compartments, like large "pigeon-holes," or else placed in thick portfolios, arranged like folio volumes, and having the names of the orders lettered on the back.

Acúleate: armed with prickles, i. e. *aculei;* as the Rose and Brier.

Acúleolate: armed with small prickles, or slightly prickly.

Acúminate: taper-pointed, as the leaf in fig. 97 and fig. 103.

Acute: merely sharp-pointed, or ending in a point less than a right angle.

Adelphous (stamens): joined in a fraternity (*adelphia*): see *monadelphous* and *diadelphous.*

Adherent: sticking to, or, more commonly, growing fast to another body; p. 104.

Adnate: growing fast to; it means born adherent. The anther is adnate when fixed by its whole length to the filament or its prolongation, as in Tulip-tree, fig. 233.

Adpressed, or *appressed:* brought into contact, but not united.

Adscendent, ascendent, or *ascending:* rising gradually upwards.

Adsurgent, or *assurgent:* same as ascending.

Adventitious: out of the proper or usual place; e. g. *Adventitious buds,* p. 26, 27.

Adventive: applied to foreign plants accidentally or sparingly spontaneous in a country, but hardly to be called naturalized.

Æquilateral: equal-sided; opposed to oblique.

Æstivation: the arrangement of parts in a flower-bud, p. 108.

Air-cells or *Air-passages:* spaces in the tissue of leaves and some stems, p. 143.

Air-Plants, p. 34.

Akénium, or *akene.* See *achenium.*

Ala (plural *alæ*): a wing; the side-petals of a papilionaceous corolla, p. 105, fig. 218, *w.*

Alabástrum: a flower-bud.

Alar: situated in the forks of a stem.

Alate: winged, as the seeds of Trumpet-Creeper (fig. 316) the fruit of the Maple, Elm (fig. 301), &c.

Albescent: whitish, or turning white.

Absorption, p. 168.

Albúmen of the seed: nourishing matter stored up with the embryo, but not within it; p. 15, 136.

Albúmen, a vegetable product; a form of proteine, p. 165.

Albuminous (seeds): furnished with albumen, as the seeds of Indian corn (fig. 38, 39), of Buckwheat (fig. 326), &c.

Albúrnum: young wood, sap-wood, p. 153.

Alpine: belonging to high mountains above the limit of forests.

Altérnate (leaves): one after another, p. 24, 71. Petals are *alternate with* the sepals, or stamens with the petals, when they stand over the intervals between them, p. 93.

Alvéolate: honeycomb-like, as the receptacle of the Cotton-Thistle.

Ament: a catkin, p. 81. *Amentaceous:* catkin-like, or catkin-bearing.

Amorphous: shapeless; without any definite form.

Amphigástrium (plural *amphigastria*): a peculiar stipule-like leaf of certain Liverworts.

Amphítropous or *Amphítropal* ovules or seeds, p. 123, fig. 272.

Ampléctant: embracing. *Amplexicaul* (leaves): clasping the stem by the base.

Ampulláceous: swelling out like a bottle or bladder.

Amyláceous: composed of starch, or starch-like.

Anántherous: without anthers. *Anánthous:* destitute of flowers; flowerless.
Anástomosing: forming a net-work (*anastomosis*), as the veins of leaves.
Anátropous or *Anátropal* ovules or seeds; p. 123, fig. 273.
Ancipital (*anceps*): two-edged, as the stem of Blue-eyed Grass.
Andrœcium: a name for the stamens taken together.
Andrógynous: having both staminate and pistillate flowers in the same cluster or inflorescence, as many species of Carex.
Ándrophore: a column of united stamens, as in a Mallow; or the support on which stamens are raised.
Anfráctuose: bent hither and thither, as the anthers of the Squash, &c.
Angiospérmæ, Angiospérmous Plants: with their seeds formed in an ovary or pericarp, p. 183.
Angular divergence of leaves, p. 72.
Annual (plant): flowering and fruiting the year it is raised from the seed, and then dying, p 21.
Ánnular: in the form of a ring, or forming a circle.
Ánnulate: marked by rings; or furnished with an
Ánnulus, or ring, like that of the spore-case of most Ferns (Manual Bot. N. States, plate 9, fig. 2) · in Mosses it is a ring of cells placed between the mouth of the spore-case and the lid, in many species.
Anterior, in the blossom, is the part next the bract, i. e. external: — while the posterior side is that next the axis of inflorescence. Thus, in the Pea, &c. the keel is *anterior,* and the standard *posterior.*
Anther: the essential part of the stamen, which contains the pollen; p. 86, 113.
Antherídium (plural *antheridia*): the organ in Mosses, &c. which answers to the anther of Flowering plants.
Antheríferous: anther-bearing.
Anthésis: the period or the act of the expansion of a flower
Anthocárpous (fruits): same as multiple fruits; p. 133.
Ánticous: same as anterior.
Antrórse: directed upwards or forwards.
Apétalous: destitute of petals; p. 90, fig. 179.
Aphýllous: destitute of leaves, at least of foliage.
Ápical: belonging to the apex or point.
Apículate: pointletted; tipped with a short and abrupt point.
Apocárpous (pistils): when the several pistils of the same flower are separate, as in a Buttercup, Sedum (fig. 168), &c.
Apóphysis: any irregular swelling; the enlargement at the base of the spore-case of the Umbrella-Moss (Manual, plate 4), &c.
Appendage: any superadded part.
Appendiculate: provided with appendages.
Appressed: where branches are close pressed to the stem, or leaves to the branch, &c.
Ápterous: wingless.
Aquatic: living or growing in water; applied to plants whether growing under water, or with all but the base raised out of it.
Aráchnoid: cobwebby; clothed with, or consisting of, soft downy fibres.
Arbóreous, Arborescent: tree-like, in size or form; p. 36.

Archegónium (plural *archegonia*): the organ in Mosses, &c., which is analogous to the pistil of Flowering Plants.

Árcuate: bent or curved like a bow.

Aréolate: marked out into little spaces or *areolæ*.

Árillate (seeds): furnished with an

Aril or *Arillus:* a fleshy growth forming a false coat or appendage to a seed; p. 135, fig. 318.

Arístate: awned, i. e. furnished with an arista, like the beard of Barley, &c.

Arístulate: diminutive of the last; short-awned.

Arrow-shaped or *Arrow-headed:* same as *sagittate;* p. 59, fig. 95.

Artículated: jointed; furnished with joints or *articulations*, where it separates or inclines to do so. *Articulated leaves*, p. 64.

Artificial Classification, p. 196.

Ascending (stems, &c.), p. 37; (seeds or ovules), p. 122.

Aspergílliform: shaped like the brush used to sprinkle holy water; as the stigmas of many Grasses.

Assimilation, p. 162.

Assurgent: same as ascending, p. 37.

Átropous or *Átropal* (ovules): same as orthotropous.

Auriculate: furnished with auricles or ear-like appendages, p. 59.

Awl-shaped: sharp-pointed from a broader base, p. 68.

Awn: the bristle or beard of Barley, Oats, &c.; or any similar bristle-like appendage.

Awned: furnished with an awn or long bristle-shaped tip.

Axil: the angle on the upper side between a leaf and the stem, p. 20.

Axile: belonging to the axis, or occupying the axis; p. 119, &c.

Axillary (buds, &c.): occurring in an axil, p 21, 77, &c.

Axis: the central line of any body; the organ round which others are attached; the root and stem. *Ascending Axis*, p. 9. *Descending Axis*, p. 9.

Baccate: berry-like, of a pulpy nature like a berry (in Latin *bacca*); p. 127.

Barbate: bearded; bearing tufts, spots, or lines of hairs.

Barbed: furnished with a *barb* or double hook; as the apex of the bristle on the fruit of Echinospermum (Stickseed), &c.

Bárbellate: said of the bristles of the pappus of some Compositæ (species of Liatris, &c.), when beset with short, stiff hairs, longer than when denticulate, but shorter than when plumose.

Barbéllulate: diminutive of barbellate.

Bark: the covering of a stem outside of the wood, p. 150, 152.

Basal: belonging or attached to the

Base: that extremity of any organ by which it is attached to its support.

Bast, Bast-fibres, p. 147.

Beaked: ending in a prolonged narrow tip.

Bearded: see *barbate*. *Beard* is sometimes used popularly for awn, more commonly for long or stiff hairs of any sort.

Bell-shaped: of the shape of a bell, as the corolla of Harebell, fig. 207, p. 102.

Berry: a fruit pulpy or juicy throughout, as a grape; p. 127.

Bi- (or *Bis*), in compound words: twice; as

Biarticulate: twice jointed, or two-jointed; separating into two pieces.

Biauriculate: having two ears, as the leaf in fig. 96.

Bicallose: having two callosities or harder spots.

Bicárinate: two-keeled, as the upper palea of Grasses.

Bicípital (*Biceps*): two-headed; dividing into two parts at the top or bottom.

Bicónjugate: twice paired, as when a petiole forks twice.

Bidéntate: having two teeth (not twice or doubly dentate).

Biénnial: of two years' continuance; springing from the seed one season, flowering and dying the next; p. 21.

Bifárious: two-ranked; arranged in two rows.

Bífid: two-cleft to about the middle, as the petals of Mouse-ear Chickweed.

Bifóliolate: a compound leaf of two leaflets; p. 66.

Bifúrcate: twice forked; or, more commonly, forked into two branches.

Bijugate: bearing two pairs (of leaflets, &c.).

Biláhiate: two-lipped, as the corolla of sage, &c, p. 105, fig. 209.

Bilámellate: of two plates (*lamellæ*), as the stigma of Mimulus.

Bilóbed: the same as two-lobed.

Bilócular: two-celled; as most anthers, the pod of Foxglove, most Saxifrages (fig. 254), &c.

Binate: in couples, two together.

Bipartite: the Latin form of two-parted; p. 62.

Bipinnate (leaf): twice pinnate; p. 66, fig. 130.

Bipinnátifid: twice pinnatifid, p. 64; that is, pinnatifid with the lobes again pinnatifid.

Biplícate: twice folded together.

Bisérial, or *Biseriate:* occupying two rows, one within the other.

Biserrate: doubly serrate, as when the teeth of a leaf, &c. are themselves serrate.

Bitérnate: twice ternate; i. e. principal divisions 3, each bearing 3 leaflets, &c.

Bladdery: thin and inflated, like the calyx of Silene inflata.

Blade of a leaf: its expanded portion; p 54.

Boat-shaped: concave within and keeled without, in shape like a small boat.

Bráchiate: with opposite branches at right angles to each other, as in the Maple and Lilac.

Bract (Latin, *bractea*). Bracts, in general, are the leaves of an inflorescence, more or less different from ordinary leaves. Specially, the bract is the small leaf or scale from the axil of which a flower or its pedicel proceeds; p. 78; and a

Bractlet (*bracteola*) is a bract seated *on* the pedicel or flower-stalk; p. 78, fig. 156.

Branch, p. 20, 36.

Bristles: stiff, sharp hairs, or any very slender bodies of similar appearance.

Bristly: beset with bristles.

Brush-shaped: see *aspergilliform*.

Bryólogy: that part of Botany which relates to Mosses.

Bud: a branch in its earliest or undeveloped state; p 20.

Bud-scales, p. 22, 50.

Bulb: a leaf-bud with fleshy scales, usually subterranean; p. 45, fig. 73.

Bulbíferous: bearing or producing bulbs.

Bulbose or *bulbous:* bulb-like in shape, &c.

Bulblets: small bulbs, borne above ground, as on the stems of the bulb-bearing Lily and on the fronds of Cistopteris bulbifera and some other Ferns; p. 46.

Bulb-scales, p. 50.

Bullate: appearing as if blistered or bladdery (from *bulla*, a bubble).

Cadúcous: dropping off very early, compared with other parts; as the calyx in the Poppy Family, falling when the flower opens.

Cæspitose, or *Céspitose:* growing in turf-like patches or tufts, like most sedges, &c.

Cálcarate: furnished with a spur (*calcar*), as the flower of Larkspur, fig. 183, and Violet, fig. 181.

Calcéolate or *Cálceiform:* slipper-shaped, like one petal of the Lady's Slipper.

Cállose: hardened; or furnished with callosities or thickened spots.

Cálycine: belonging to the calyx.

Calýculate: furnished with an outer accessory calyx (*calyculus*) or set of bracts looking like a calyx, as in true Pinks.

Calýptra: the hood or veil of the capsule of a Moss: Manual, p. 607, &c.

Calýptriform: shaped like a calyptra or candle-extinguisher.

Calyx: the outer set of the floral envelopes or leaves of the flower; p. 85.

Cambium and *Cambium-layer,* p. 154.

Campánulate: bell-shaped; p. 102, fig. 207.

Campylótropous, or *Campylótropal;* curved ovules and seeds of a particular sort; p. 123, fig. 271.

Campylospérmous: applied to fruits of Umbelliferæ when the seed is curved in at the edges, forming a groove down the inner face; as in Sweet Cicely.

Canalículate: channelled, or with a deep longitudinal groove.

Cáncellate: latticed, resembling lattice-work.

Canéscent: grayish-white; hoary, usually because the surface is covered with fine white hairs. *Incanous* is whiter still.

Capilláceous, Cápillary: hair-like in shape; as fine as hair or slender bristles.

Cápitate: having a globular apex, like the head on a pin; as the stigma of Cherry, fig. 213; or forming a head, like the flower-cluster of Button-bush, fig. 161.

Capitéllate: diminutive of capitate; as the stigmas of fig. 255.

Capítulum (a little head): a close rounded dense cluster or head of sessile flowers; p. 80, fig. 161.

Capréolate: bearing tendrils (from *capreolus*, a tendril).

Capsule: a pod; any dry dehiscent seed-vessel; p. 131, fig. 305, 306.

Cápsular: relating to, or like a capsule.

Carína: a keel; the two anterior petals of a papilionaceous flower, which are combined to form a body shaped somewhat like the keel (or rather the prow) of a vessel; p. 105, fig. 218, *k*.

Cárinate: keeled; furnished with a sharp ridge or projection on the lower side.

Cariópsis, or *Caryópsis:* the one-seeded fruit or grain of Grasses, &c., p. 351.

Cárneous: flesh-colored; pale red.

Cárnose: fleshy in texture.

Cárpel, or *Carpídium:* a simple pistil, or one of the parts or leaves of which a compound pistil is composed; p. 117.

Cárpellary: pertaining to a carpel.

Carpology: that department of Botany which relates to fruits.

Cárpophore: the stalk or support of a fruit or pistil within the flower; as in fig. 276 – 278.

Cartiláginous, or *Cartilagíneous:* firm and tough, like cartilage, in texture.

Cáruncle: an excrescence at the scar of some seeds; as those of Polygala.

Carúnculate: furnished with a caruncle.

Caryophylláceous: pink-like: applied to a corolla of 5 long-clawed petals; fig. 200.

Catkin: a scaly deciduous spike of flowers, an ament; p. 81.

Caudate: tailed, or tail-pointed.

Caudex: a sort of trunk, such as that of Palms; an upright rootstock; p. 37.

Caulescent: having an obvious stem; p. 36.

Caúlicle: a little stem, or rudimentary stem; p. 6.

Caúline: of or belonging to a stem (*caulis,* in Latin), p. 36.

Cell (diminutive *Cellule*): the cavity of an anther, ovary, &c., p. 113, 119; one of the elements or vesicles of which plants are composed; p. 140, 142.

Céllular tissue of plants; p. 142. *Cellular Bark,* p. 152.

Cellulose, p. 159.

Centrífugal (inflorescence): produced or expanding in succession from the centre outwards; p. 82. The radicle is centrifugal, when it points away from the centre of the fruit.

Centripetal: the opposite of centrifugal; p. 79, 83.

Cereal: belonging to corn, or corn-plants.

Cérnuous: nodding; the summit more or less inclining.

Chaff: small membranous scales or bracts on the receptacle of Compositæ; the glumes, &c. of Grasses.

Chaffy: furnished with chaff, or of the texture of chaff.

Chaláza: that part of the ovule where all the parts grow together; p. 122.

Channelled: hollowed out like a gutter; same as *canaliculate.*

Character: a phrase expressing the essential marks of a species, genus, &c. which distinguish it from all others; p. 180.

Chartáceous: of the texture of paper or parchment.

Chlórophyll: the green grains in the cells of the leaf, and of other parts exposed to the light, which give to herbage its green color; p. 155.

Chrómule: coloring matter in plants, especially when not green, or when liquid.

Cicatrix: the scar left by the fall of a leaf or other organ.

Ciliate: beset on the margin with a fringe of *cilia,* i. e. of hairs or bristles, like the eyelashes fringing the eyelids, whence the name.

Cinéreous, or *Ineráceous:* ash-grayish; of the color of ashes.

Círcinate: rolled inwards from the top, like a crosier, as the shoots of Ferns; p. 76, fig. 154; the flower-clusters of Heliotrope, &c.

Circumscíssile, or *Circumcissile:* divided by a circular line round the sides, as the pods of Purslane, Plantain, &c.; p. 133, fig. 298, 311.

Circumscription: the general outline of a thing.

Cirrhíferous, or *Cirrhose:* furnished with a tendril (Latin, *cirrhus*); as the Grape-vine. *Cirrhose* also means resembling or coiling like tendrils, as the leaf-stalks of Virgin's-bower; p. 37.

Class, p. 175, 177.

Classification, p. 173.

Cláthrate: latticed; same as *cancellate*.
Clávate: club-shaped; slender below and thickened upwards.
Claw: the narrow or stalk-like base of some petals, as of Pinks; p. 102, fig. 200.
Climbing: rising by clinging to other objects; p. 37.
Club-shaped: see *clavate*.
Clustered: leaves, flowers, &c. aggregated or collected into a bunch
Clýpeate: buckler-shaped.
Coádunate: same as *connate*; i. e. united.
Coaléscent: growing together.
Coárctate: contracted or brought close together.
Coated Bulbs, p. 46.
Cobwebby: same as *arachnoid*: bearing hairs like cobwebs or gossamer.
Coccus (plural *cocci*): anciently a berry; now mostly used to denote the carpels of a dry fruit which are separable from each other, as of Euphorbia.
Cochleáriform: spoon-shaped.
Cóchleate: coiled or shaped like a snail-shell.
Cœlospérmous: applied to those fruits of Umbelliferæ which have the seed hollowed on the inner face, by the curving inwards of the top and bottom; as in Coriander.
Coherent, in Botany, is usually the same as *connate*; p. 104.
Collective fruits, p. 133.
Collum or *Collar:* the neck or line of junction between the stem and the root.
Columélla: the axis to which the carpels of a compound pistil are often attached, as in Geranium (fig. 278), or which is left when a pod opens, as in Azalea and Rhododendron.
Column: the united stamens, as in Mallow, or the stamens and pistils united into one body, as in the Orchis family, fig. 226.
Columnar: shaped like a column or pillar.
Coma: a tuft of any sort (literally, a head of hair); p. 135, fig. 317.
Cómose: tufted; bearing a tuft of hairs, as the seeds of Milkweed; fig. 317.
Cómmissure: the line of junction of two carpels, as in the fruit of Umbelliferæ, such as Parsnip, Caraway, &c.
Common: used as "general," in contradistinction to "partial"; e. g. "common involucre," p. 81.
Cómplanate: flattened.
Compound leaf, p. 64. *Compound pistil*, p. 118. *Compound umbel*, &c., p. 81.
Complete (flower), p. 89.
Complicate: folded upon itself.
Compressed: flattened on two opposite sides.
Condúplicate: folded upon itself lengthwise, as are the leaves of Magnolia in the bud, p. 76.
Cone: the fruit of the Pine family; p. 133, fig. 314.
Cónfluent: blended together; or the same as *coherent*.
Confórmed: similar to another thing it is associated with or compared to; or closely fitted to it, as the skin to the kernel of a seed.
Congésted, Conglómerate: crowded together.
Cónjugate: coupled; in single pairs.
Connate: united or grown together from the first.

Connective, Connectivum: the part of the anther connecting its two cells; p. 113.
Connivent: converging, or brought close together.
Consolidated forms of vegetation, p. 47.
Continuous: the reverse of interrupted or articulated.
Contorted: twisted together. *Contorted æstivation:* same as *convolute;* p. 109.
Contortuplicate: twisted back upon itself.
Contracted: either narrowed or shortened.
Contrary: turned in an opposite direction to another organ or part with which it is compared.
Convolute: rolled up lengthwise, as the leaves of the Plum in vernation; p. 76, fig. 151. In æstivation, same as *contorted;* p. 109.
Cordate: heart-shaped; p. 58, fig. 90, 99.
Coriaceous: resembling leather in texture.
Corky: of the texture of cork. *Corky layer* of bark, p. 152.
Corm, Cormus: a solid bulb, like that of Crocus; p. 44, fig. 71, 72.
Córneous: of the consistence or appearance of horn, as the albumen of the seed of the Date, Coffee, &c.
Cornículate: furnished with a small horn or spur.
Cornúte: horned; bearing a horn-like projection or appendage.
Coróllа: the leaves of the flower within the calyx; p. 86.
Corolláceous, Corollíne: like or belonging to a corolla.
Coróna: a coronet or crown; an appendage at the top of the claw of some petals, as Silene and Soapwort, fig. 200, or of the tube of the corolla of Hound's-Tongue, &c.
Corónate: crowned; furnished with a crown.
Córtical: belonging to the bark (*cortex*).
Córymb: a sort of flat or convex flower-cluster; p. 79, fig. 158.
Corymbóse: approaching the form of a corymb, or branched in that way; arranged in corymbs.
Costa: a rib; the midrib of a leaf, &c. *Costate:* ribbed.
Cotylédons: the first leaves of the embryo; p. 6, 137.
Cratériform: goblet-shaped; broadly cup-shaped.
Creeping (stems): growing flat on or beneath the ground and rooting; p. 37.
Crémocarp: a half-fruit, or one of the two carpels of Umbelliferæ.
Crenate, or *Crenelled:* the edge scalloped into rounded teeth; p. 62, fig. 114.
Crested, or *Cristate:* bearing any elevated appendage like a crest.
Cribrose: pierced like a sieve with small apertures.
Crinite: bearded with long hairs, &c.
Crown: see *corona.*
Crowning: borne on the apex of anything.
Cruciate, or *Cruciform:* cross-shaped, as the four spreading petals of the Mustard (fig. 187), and all the flowers of that family.
Crustaceous: hard, and brittle in texture; crust-like.
Cryptógamous, or *Cryptogamic:* relating to Cryptogamia; p. 172, 197.
Cucúllate: hooded, or hood-shaped, rolled up like a cornet of paper, or a hood (*cucullus*), as the spathe of Indian Turnip, fig. 162.
Culm: a straw; the stem of Grasses and Sedges.
Cúneate, Cúneiform: wedge-shaped; p. 58, fig. 94.

Cup-shaped: same as cyathiform, or near it.

Cúpule: a little cup; the cup to the acorn of the Oak, p. 130, fig. 299.

Cúpulate: provided with a cupule.

Cúspidate: tipped with a sharp and stiff point.

Cut: same as incised, or applied generally to any sharp and deep division.

Cúticle: the skin of plants, or more strictly its external pellicle.

Cyáthiform: in the shape of a cup, or particularly of a wine-glass.

Cycle: one complete turn of a spire, or a circle; p. 73.

Cyclical. rolled up circularly, or coiled into a complete circle.

Cyclósis: the circulation in closed cells, p. 167.

Cylindraceous: approaching to the

Cylíndrical form; as that of stems, &c., which are round, and gradually if at all tapering.

Cýmbæform, or *Cymbiform:* same as boat-shaped.

Cyme: a cluster of centrifugal inflorescence, p 82, fig. 165, 167.

Cýmose: furnished with cymes, or like a cyme.

Deca- (in composition of words of Greek derivation): ten; as

Decágynous: with 10 pistils or styles. *Decándrous:* with 10 stamens.

Deciduous: falling off, or subject to fall, said of leaves which fall in autumn, and of a calyx and corolla which fall before the fruit forms.

Declined: turned to one side, or downwards, as the stamens of Azalea nudiflora.

Decompound: several times compounded or divided; p 67, fig. 138.

Decumbent: reclined on the ground, the summit tending to rise; p. 37.

Decurrent (leaves): prolonged on the stem beneath the insertion, as in Thistles.

Decússate: arranged in pairs which successively cross each other; fig. 147.

Definite: when of a uniform number, and not above twelve or so.

Deflexed: bent downwards.

Deflorate: past the flowering state, as an anther after it has discharged its pollen.

Dehiscence: the mode in which an anther or a pod regularly bursts or splits open; p. 132.

Dehiscent: opening by regular dehiscence.

Deliquescent: branching off so that the stem is lost in the branches, p. 25.

Deltoid: of a triangular shape, like the Greek capital Δ.

Demersed: growing below the surface of water.

Dendroid, Dendritic: tree-like in form or appearance.

Dentate: toothed (from the Latin *dens,* a tooth), p. 61, fig. 113.

Denticulate: furnished with denticulations, or very small teeth: diminutive of the last.

Depauperate (impoverished or starved): below the natural size.

Depressed: flattened, or as if pressed down from above; flattened vertically.

Descending: tending gradually downwards.

Determinate Inflorescence, p. 81, 83.

Dextrorse: turned to the right hand.

Di- (in Greek compounds): two, as

Diádelphous (stamens): united by their filaments in two sets; p. 111, fig. 227.

Diándrous: having two stamens, p. 112.

Diagnosis. a short distinguishing character, or descriptive phrase.

Diáphanous: transparent or translucent.

Dichlamýdeous (flower): having both calyx and corolla.

Dichótomous: two-forked.

Diclínous: having the stamens in one flower, the pistils in another; p. 89, fig. 176, 177.

Dicóccous (fruit): splitting into two *cocci,* or closed carpels.

Dicotylédonous (embryo): having a pair of cotyledons; p. 16, 137.

Dicotyledonous Plants, p. 150, 182.

Didymous: twin.

Didýnamous (stamens); having four stamens in two pairs, one pair shorter than the other, as in fig. 194, 195.

Diffuse: spreading widely and irregularly.

Dígitate (fingered): where the leaflets of a compound leaf are all borne on the apex of the petiole; p. 65, fig. 129.

Dígynous (flower): having two pistils or styles, p. 116.

Dímerous: made up of two parts, or its organs in twos.

Dimídiate: halved; as where a leaf or leaflet has only one side developed, or a stamen has only one lobe or cell; fig. 239.

Dimorphous: of two forms.

Diœcious, or *Dioícous:* where the stamens and pistils are in separate flowers on different plants; p. 89.

Dipétalous: of two petals. *Diphýllous:* two-leaved. *Dípterous:* two-winged.

Disciform or *Disk-shaped:* flat and circular, like a disk or quoit.

Disk: the face of any flat body; the central part of a head of flowers, like the Sunflower, or Coreopsis (fig. 224), as opposed to the *ray* or margin; a fleshy expansion of the receptacle of a flower; p. 125.

Dissected: cut deeply into many lobes or divisions.

Dissépiments: the partitions of an ovary or a fruit; p. 119.

Dístichous: two-ranked; p. 73.

Distinct: uncombined with each other; p. 102.

Divárícate: straddling; very widely divergent.

Divided (leaves, &c.): cut into divisions extending about to the base or the mid-rib; p. 62, fig. 125.

Dodeca- (in Greek compounds): twelve; as

Dodecágynous: with twelve pistils or styles.

Dodecandrous: with twelve stamens.

Dolabriform: axe-shaped.

Dorsal: pertaining to the back (*dorsum*) of an organ.

Dorsal Suture, p. 117.

Dotted Ducts, p. 148.

Double Flowers, so called: where the petals are multiplied unduly; p. 85, 98.

Downy: clothed with a coat of soft and short hairs.

Drupe: a stone-fruit; p. 128, fig. 285.

Drupaceous: like or pertaining to a drupe.

Ducts: the so-called vessels of plants; p. 146, 148.

Dumose: bushy, or relating to bushes.

Duramen: the heart-wood, p. 153.

Dwarf: remarkably low in stature.

E-, or *Ex-*, at the beginning of compound words, means destitute of; as *ecostate*, without a rib or midrib; *exalbuminous*, without albumen, &c.

Eared: see *auriculate:* p. 59, fig. 96.

Ebrácteate: destitute of bracts.

Echínate: armed with prickles (like a hedgehog). *Echínulate:* a diminutive of it.

Edentate: toothless.

Effete: past bearing, &c.; said of anthers which have discharged their pollen.

Eglandulose: destitute of glands.

Eláters: threads mixed with the spores of Liverworts. (Manual, p. 682.)

Ellipsoidal: approaching an elliptical figure.

Elliptical: oval or oblong, with the ends regularly rounded; p. 58, fig. 88.

Emárginate: notched at the summit; p. 60, fig. 108.

Émbryo: the rudimentary undeveloped plantlet in a seed; p. 6, fig. 9, 12, 26, 31 – 37, &c., and p. 136. *Embryo-sac*, p. 139.

Emersed: raised out of water.

Endecágynous: with eleven pistils or styles. *Endecándrous:* with eleven stamens.

Éndocarp: the inner layer of a pericarp or fruit; p. 128.

Éndochrome: the coloring matter of Algæ and the like.

Endógenous Stems, p. 150. *Endogenous Plants*, p. 150.

Endosmose: p. 168.

Éndosperm: another name for the albumen of a seed.

Éndostome: the orifice in the inner coat of an ovule.

Ennea-: nine. *Enneágynous:* with nine petals or styles.

Enneándrous: with nine stamens.

Ensiform: sword-shaped; as the leaves of Iris, fig. 134

Entire: the margins not at all toothed, notched, or divided, but even; p. 61.

Ephemeral: lasting for a day or less, as the corolla of Purslane, &c.

Epi-, in composition: upon; as

Épicarp: the outermost layer of a fruit; p. 128.

Epidermal: relating to the *Epidérmis*, or the skin of a plant; p. 152, 155.

Epigæous: growing on the earth, or close to the ground.

Epígynous: upon the ovary; p. 105, 111.

Epipétalous: borne on the petals or the corolla.

Epiphýllous: borne on a leaf.

Epiphyte: a plant growing on another plant, but not nourished by it; p. 34.

Epiphýtic or *Epiphýtal:* relating to *Epiphytes:* p. 34.

Episperm: the skin or coat of a seed, especially the outer coat.

Equal: same as *regular;* or of the same number or length, as the case may be, of the body it is compared with.

Equally pinnate: same as abruptly pinnate; p. 65.

Équitant (riding straddle); p. 68, fig. 133, 134.

Erose: eroded, as if gnawed.

Eróstrate: not beaked.

Essential Organs of the flower, p 85.

Estivátion: see *æstivation.*

Etiolated: blanched by excluding the light, as the stalks of Celery.

Evergreen: holding the leaves over winter and until new ones appear, or longer

Exalbúminous (seed): destitute of albumen; p. 136.

Excurrent: running out, as when a midrib projects beyond the apex of a leaf, or a trunk is continued to the very top of a tree.
Exhalation, p. 156, 169.
Exógenous Stems, p. 150. *Exogenous Plants*, p. 182.
Éxostome: the orifice in the outer coat of the ovule; p. 122.
Explanate: spread or flattened out.
Exserted: protruding out of, as the stamens out of the corolla of fig. 201.
Exstípulate: destitute of stipules.
Extra-axillary: said of a branch or bud a little out of the axil; as the upper accessory buds of the Butternut, p. 27, fig. 52.
Extrórse: turned outwards; the anther is extrorse when fastened to the filament on the side next the pistil, and opening on the outer side, as in Iris; p. 113.

Falcate: scythe-shaped; a flat body curved, its edges parallel.
Family: p. 176.
Farinaceous: mealy in texture. *Fárinose:* covered with a mealy powder.
Fásciate: banded; also applied to monstrous stems which grow flat.
Fáscicle: a close cluster; p. 83.
Fáscicled, Fascículated: growing in a bundle or tuft, as the leaves of Pine and Larch (fig. 139, 140), the roots of Pæony and Dahlia, fig. 60.
Fastigiate: close, parallel, and upright, as the branches of Lombardy Poplar.
Faux (plural, *fauces*): the throat of a calyx, corolla, &c.
Favéolate, Fávose: honeycombed; same as *alveolate*.
Feather-veined: where the veins of a leaf spring from along the sides of a midrib; p. 57, fig. 86 – 94.
Female (flowers): with pistils and no stamens.
Fenéstrate: pierced with one or more large holes, like windows.
Ferrugineous, or *Ferruginous:* resembling iron-rust; red-grayish.
Fertile: fruit-bearing, or capable of producing fruit; also said of anthers when they produce good pollen.
Fertilization: the process by which pollen causes the embryo to be formed.
Fibre, p. 145. *Fibrous:* containing much fibre, or composed of fibres.
Fibrillose: formed of small fibres.
Fibrine, p. 165.
Fiddle-shaped: obovate with a deep recess on each side.
Filament: the stalk of a stamen; p. 86, fig. 170, *a;* also any slender thread-shaped appendage.
Filaméntose, or *Filamentous:* bearing or formed of slender threads.
Filiform: thread-shaped; long, slender, and cylindrical.
Fimbriate: fringed; furnished with fringes (*fimbriæ*).
Fistular or *Fistulose:* hollow and cylindrical, as the leaves of the Onion.
Flabélliform or *Flabéllate:* fan-shaped; broad, rounded at the summit, and narrowed at the base.
Flágellate, or *Flagélliform:* long, narrow, and flexible, like the thong of a whip; or like the runners (*flagellæ*) of the Strawberry.
Flavescent: yellowish, or turning yellow.
Fleshy: composed of firm pulp or flesh.
Fleshy Plants, p. 47.

Fléxuose, or *Fléxuous:* bending gently in opposite directions, in a zigzag way.
Floating: swimming on the surface of water.
Flóccose: composed, or bearing tufts, of woolly or long and soft hairs.
Flora (the goddess of flowers): the plants of a country or district, taken together, or a work systematically describing them; p. 3.
Floral: relating to the blossom.
Floral Envelopes: the leaves of the flower; p. 85, 99.
Floret: a diminutive flower; one of the flowers of a head (or of the so-called compound flower) of Compositæ, p. 106.
Flower: the whole organs of reproduction of Phænogamous plants; p. 84.
Flower-bud: an unopened flower.
Flowering Plants, p. 177. *Flowerless Plants*, p. 172, 177.
Foliáceous: belonging to, or of the texture or nature of, a leaf (*folium*).
Fóliose: leafy; abounding in leaves.
Fóliolate: relating to or bearing leaflets (*foliola*).
Fóllicle: a simple pod, opening down the inner suture; p. 131, fig. 302.
Follícular: resembling or belonging to a follicle.
Food of Plants, p. 160.
Foramen: a hole or orifice, as that of the ovule; p. 122.
Fornix: little arched scales in the throat of some corollas, as of Comfrey.
Fórnicate: over-arched, or arching over.
Fóveate: deeply pitted. *Fovéolate:* diminutive of *foveate*.
Free: not united with any other parts of a different sort; p. 103.
Fringed: the margin beset with slender appendages, bristles, &c.
Frond: what answers to leaves in Ferns; the stem and leaves fused into one body, as in Duckweed and many Liverworts, &c.
Frondescence: the bursting into leaf.
Fróndose: frond-bearing; like a frond: or sometimes used for leafy.
Fructification: the state of fruiting. Organs of, p. 76.
Fruit: the matured ovary and all it contains or is connected with; p. 126.
Frutéscent: somewhat shrubby; becoming a shrub (*frutex*).
Frutículose: like a small shrub. *Frúticose:* shrubby; p. 36.
Fugacious: soon falling off or perishing.
Fulvous: tawny; dull yellow with gray.
Funículus: the stalk of a seed or ovule; p. 122.
Funnel-form, or *Funnel-shaped:* expanding gradually upwards, like a funnel or tunnel; p. 102.
Fúrcate: forked.
Furfuráceous: covered with bran-like fine scurf.
Furrowed: marked by longitudinal channels or grooves
Fuscous: deep gray-brown.
Fúsiform: spindle-shaped; p. 32.

Gáleate: shaped like a helmet (*galea*); as the upper sepal of the Monkshood, fig. 185, and the upper lip of the corolla of Dead-Nettle, fig. 209.
Gamopétalous: of united petals; same as *monopetalous*, and a better word; p. 102.
Gamophýllous: formed of united leaves. *Gamosépalous:* formed of united sepals.

Géminate: twin; in pairs; as the flowers of Linnæa.
Gemma: a bud.
Gemmation: the state of budding, or the arrangement of parts in the bud.
Gémmule: a small bud; the buds of Mosses; the plumule, p. 6.
Geniculate: bent abruptly, like a knee (*genu*), as many stems.
Genus: a kind; a rank above species; p. 175, 176.
Generic Names, p. 178. *Generic Character*, p. 181.
Geographical Botany: the study of plants in their geographical relations, p. 3.
Germ: a growing point; a young bud; sometimes the same as embryo; p. 136.
Germen: the old name for ovary.
Germination: the development of a plantlet from the seed; p. 5, 137.
Gibbous: more tumid at one place or on one side than the other.
Glabrate: becoming glabrous with age, or almost glabrous.
Glabrous: smooth, i. e. having no hairs, bristles, or other pubescence.
Gladiate: sword-shaped; as the leaves of Iris, fig. 134.
Glands: small cellular organs which secrete oily or aromatic or other products: they are sometimes sunk in the leaves or rind, as in the Orange, Prickly Ash, &c.; sometimes on the surface as small projections; sometimes raised on hairs or bristles (*glandular hairs, &c.*), as in the Sweetbrier and Sundew. The name is also given to any small swellings, &c., whether they secrete anything or not.
Glandular, Glandulose: furnished with glands, or gland-like.
Glans (*Gland*): the acorn or mast of Oak and similar fruits.
Glaucescent: slightly glaucous, or bluish-gray.
Glaucous: covered with a *bloom*, viz. with a fine white powder that rubs off, like that on a fresh plum, or a cabbage-leaf.
Globose: spherical in form, or nearly so. *Glóbular:* nearly globose.
Glochidiate (hairs or bristles): barbed; tipped with barbs, or with a double hooked point.
Glómerate: closely aggregated into a dense cluster.
Glómerule: a dense head-like cluster; p. 83.
Glossology: the department of Botany in which technical terms are explained.
Glumaceous: glume-like, or glume-bearing.
Glume: Glumes are the husks or floral coverings of Grasses, or, particularly, the outer husks or bracts of each spikelet. (Manual, p. 535)
Glumelles: the inner husks, or paleæ, of Grasses.
Gluten: a vegetable product containing nitrogen; p. 165.
Granular: composed of grains. *Granule:* a small grain.
Growth, p 138.
Grumous or *Grumose:* formed of coarse clustered grains.
Guttate: spotted, as if by drops of something colored.
Gymnocárpous: naked-fruited.
Gymnospérmous: naked-seeded; p. 121.
Gymnospérmæ, or *Gymnospermous Plants*, p. 184; Manual, p. xxiii.
Gynándrous: with stamens borne on, i. e. united with, the pistil; p. 111, fig. 226.
Gynæcium: a name for the pistils of a flower taken altogether.
Gýnobase: a particular receptacle or support of the pistils, or of the carpels of a compound ovary, as in Geranium, fig. 277, 278.

Gynophore: a stalk raising a pistil above the stamens, as in the Cleome Family, p. 276.
Gyrate: coiled in a circle: same as *circinate*.
Gyrose: strongly bent to and fro.

Habit: the general aspect of a plant, or its mode of growth.
Habitat: the situation in which a plant grows in a wild state.
Hairs: hair-like projections or appendages of the surface of plants.
Hairy: beset with hairs, especially longish ones.
Halberd-shaped, or *Halberd-headed:* see *hastate*.
Halved: when appearing as if one half of the body were cut away.
Hamate or *Hamose:* hooked; the end of a slender body bent round.
Hámulose: bearing a small hook; a diminutive of the last.
Hastate or *Hastile:* shaped like a halberd; furnished with a spreading lobe on each side at the base; p. 59, fig. 97.
Heart-shaped: of the shape of a heart as commonly painted; p. 58, fig. 90.
Heart-wood: the older or matured wood of exogenous trees; p. 153.
Helicoid: coiled like a *helix* or snail-shell.
Helmet: the upper sepal of Monkshood in this shape, fig. 185, &c.
Hemi- (in compounds from the Greek): half; e. g. *Hemispherical*, &c.
Hémicarp: half-fruit, or one carpel of an Umbelliferous plant.
Hemítropous or *Hemítropal* (ovule or seed): nearly same as *amphitropous*, p. 123.
Hepta- (in words of Greek origin): seven; as,
Heptágynous: with seven pistils or styles.
Heptámerous: its parts in sevens. *Heptándrous:* having seven stamens.
Herb, p. 20.
Herbaceous: of the texture of common herbage; not woody; p. 36.
Herbarium: the botanist's arranged collection of dried plants; p. 201.
Hermaphrodite (flower): having both stamens and pistils in the same blossom; same as *perfect;* p. 89.
Heterocárpous: bearing fruit of two sorts or shapes, as in Amphicarpæa.
Heterógamous: bearing two or more sorts of flowers as to their stamens and pistils; as in Aster, Daisy, and Coreopsis.
Heteromórphous: of two or more shapes.
Heterótropous, or *Heterótropal* (ovule): the same as *amphitropous;* p. 123.
Hexa- (in Greek compounds): six; as
Hexágonal: six-angled. *Hexágynous:* with six pistils or styles.
Hexámerous: its parts in sixes. *Hexándrous:* with six stamens.
Hexápterous: six-winged.
Hilar: belonging to the hilum.
Hilum: the scar of the seed; its place of attachment; p 122, 135.
Hippocrépiform: horseshoe-shaped.
Hirsute: hairy with stiffish or beard-like hairs.
Hispid: bristly; beset with stiff hairs. *Hispídulous* is a diminutive of it.
Hoary: grayish-white; see *canescent*, &c.
Homógamous: a head or cluster with flowers all of one kind, as in Eupatorium.
Homogéneous: uniform in nature; all of one kind.
Homomállous (leaves, &c.): originating all round a stem, but all bent or curved

Homomórphous: all of one shape.
Homótropous or *Homótropal* (embryo): curved with the seed; curved one way.
Hood: same as *helmet* or *galea.* *Hooded:* hood-shaped; see *cucullate.*
Hooked: same as *hamate.*
Horn: a spur or some similar appendage. *Horny:* of the texture of horn.
Hortus Siccus: an herbarium, or collection of dried plants; p. 201.
Humifuse: spread over the surface of the ground.
Hyaline: transparent, or partly so.
Hybrid: a cross-breed between two allied species.
Hypocratériform: salver-shaped; p. 101, fig. 202, 208.
Hypogéan: produced under ground.
Hypógynous: inserted under the pistil; p. 103, fig. 212.

Icosándrous: having 12 or more stamens inserted on the calyx.
Imbricate, Imbricated, Imbricative: overlapping one another, like tiles or shingles on a roof, as the scales of the involucre of Zinnia, &c., or the bud-scales of Horsechesnut (fig. 48) and Hickory (fig. 49). In æstivation, where some leaves of the calyx or corolla are overlapped on both sides by others; p. 109.
Immarginate: destitute of a rim or border.
Immersed: growing wholly under water.
Impari-pinnate: pinnate with a single leaflet at the apex; p. 65, fig. 126.
Imperfect flowers: wanting either stamens or pistils; p. 89.
Inæquilateral: unequal-sided, as the leaf of a Begonia.
Incanous: hoary with white pubescence.
Incised: cut rather deeply and irregularly; p. 62.
Included: enclosed; when the part in question does not project beyond another.
Incomplete Flower: wanting calyx or corolla; p. 90.
Incrassated: thickened.
Incumbent: leaning or resting upon: the cotyledons are incumbent when the back of one of them lies against the radicle; the anthers are incumbent when turned or looking inwards, p. 113.
Incurved: gradually curving inwards.
Indefinite: not uniform in number, or too numerous to mention (over 12).
Indefinite or *Indeterminate Inflorescence:* p. 77.
Indehíscent: not splitting open; i. e. not dehiscent; p. 127.
Indígenous: native to the country.
Individuals: p. 173.
Indúplicate: with the edges turned inwards; p. 109.
Indúsium: the shield or covering of a fruit-dot of a Fern. (Manual, p 588.)
Inferior: growing below some other organ; p. 104, 121.
Inflated: turgid and bladdery.
Inflexed: bent inwards.
Inflorescence: the arrangement of flowers on the stem; p. 76.
Infra-axillary: situated beneath the axil.
Infundíbuliform or *Infundíbular:* funnel-shaped; p. 102, fig. 199.
Innate (anther): attached by its base to the very apex of the filament; p. 113.
Innovation: an incomplete young shoot, especially in Mosses.
Inorganic Constituents, p. 160.

Insertion: the place or the mode of attachment of an organ to its support; p. 72.
Intercellular Passages or *Spaces*, p. 143, fig. 341.
Internode: the part of a stem between two nodes; p. 42.
Interruptedly pinnate: pinnate with small leaflets intermixed with larger ones, as in Water Avens.
Intrafoliaceous (stipules, &c.): placed between the leaf or petiole and the stem.
Introrse: turned or facing inwards, i. e. towards the axis of the flower; p. 113.
Inverse or *Inverted:* where the apex is in the direction opposite to that of the organ it is compared with.
Ínvolucel: a partial or small involucre; p. 81.
Involúcellate: furnished with an involucel.
Involúcrate: furnished with an involucre.
Ínvolucre: a whorl or set of bracts around a flower, umbel, or head; p. 79.
Ínvolute, in vernation, p. 76: rolled inwards from the edges.
Irregular Flowers, p. 91.

Jointed: separate or separable at one or more places into pieces; p. 64, &c.

Keel: a projecting ridge on a surface, like the keel of a boat; the two anterior petals of a papilionaceous corolla; p. 105, fig. 217, 218, *k*.
Keeled: furnished with a keel or sharp longitudinal ridge.
Kernel of the ovule and seed, p. 122, 136.
Kidney-shaped: resembling the outline of a kidney; p. 59, fig. 100.

Labéllum: the odd petal in the Orchis Family.
Labiate: same as *bilabiate* or two-lipped; p. 105.
Lacíniate: slashed; cut into deep narrow lobes (called *laciniæ*).
Lactescent: producing milky juice, as does the Milkweed, &c.
Lácunose: full of holes or gaps.
Lævigate: smooth as if polished.
Lámellar or *Lamellate:* consisting of flat plates (*lamellæ*).
Lámina: a plate or blade: the blade of a leaf, &c., p 54.
Lanate: woolly; clothed with long and soft entangled hairs.
Lanceolate: lance-shaped; p. 58, fig. 86.
Lanuginous: cottony or woolly.
Latent buds: concealed or undeveloped buds; p. 26, 27.
Lateral: belonging to the side.
Latex: the milky juice, &c. of plants.
Lax: loose in texture, or sparse; the opposite of crowded.
Leaf, p. 49. *Leaf-buds*, p. 20, 27.
Leaflet: one of the divisions or blades of a compound leaf; p. 64.
Leaf-like: same as *foliaceous*.
Leathery: of about the consistence of leather; coriaceous.
Legume: a simple pod, dehiscent into two pieces, like that of the Pea, p. 131, fig. 303; the fruit of the Pea Family (*Leguminosæ*), of whatever shape.
Legumine, p. 165.
Leguminous: belonging to legumes, or to the Leguminous Family.
Lenticular: lens-shaped; i. e. flattish and convex on both sides.

Lépidote: leprous; covered with scurfy scales.

Liber: the inner, fibrous bark of Exogenous plants; p. 152.

Ligneous, or *Lignose:* woody in texture.

Ligulate: furnished with a ligule; p. 106.

Lígule: the strap-shaped corolla in many Compositæ, p. 106, fig. 220; the little membranous appendage at the summit of the leaf-sheaths of most Grasses.

Limb: the blade of a leaf, petal, &c.; p. 54, 102.

Linear: narrow and flat, the margins parallel; p. 58, fig. 85.

Líneate: marked with parallel lines. *Lineolate:* marked with minute lines.

Lingulate, Linguiform: tongue-shaped.

Lip: the principal lobes of a bilabiate corolla or calyx, p. 105; the odd and peculiar petal in the Orchis Family.

Lobe: any projection or division (especially a rounded one) of a leaf, &c.

Locéllus (plural *locelli*): a small cell, or compartment of a cell, of an ovary or anther.

Lócular: relating to the cell or compartment (*loculus*) of an ovary, &c.

Loculicídal (dehiscence): splitting down through the middle of the back of each cell; p. 132, fig. 305.

Locústa: a name for the spikelet of Grasses.

Lóment: a pod which separates transversely into joints; p. 131, fig. 304.

Lomentáceous: pertaining to or resembling a loment.

Lórate: thong-shaped.

Lúnate: crescent-shaped. *Lunulate:* diminutive of *lunate.*

Lýrate: lyre-shaped; a pinnatifid leaf of an obovate or spatulate outline, the end-lobe large and roundish, and the lower lobes small, as in Winter-Cress and Radish, fig. 59.

Mace: the aril of the Nutmeg; p. 135.

Máculate: spotted or blotched.

Male (flowers): having stamens but no pistil.

Mámmose: breast-shaped.

Marcescent: withering without falling off.

Marginal: belonging to the edge or margin.

Marginate: margined, with an edge different from the rest.

Masked: see *personate.*

Median: belonging to the middle.

Medúllary: belonging to, or of the nature of pith (*medulla*); pithy.

Medullary Rays: the silver-grain of wood; p. 151.

Medullary Sheath: a set of ducts just around the pith; p. 151.

Membranaceous or *Mémbranous:* of the texture of membrane; thin and more or less translucent.

Meniscoid: crescent-shaped.

Méricarp: one carpel of the fruit of an Umbelliferous plant.

Merismatic: separating into parts by the formation of partitions within.

Mésocarp: the middle part of a pericarp, when that is distinguishable into three layers; p. 128.

Mesophlœum: the middle or green bark.

Micropyle: the closed orifice of the seed; p. 135.
Midrib: the middle or main rib of a leaf; p. 55.
Milk-Vessels: p. 148.
Miniate: vermilion-colored.
Mitriform: mitre-shaped; in the form of a peaked cap.
Monadelphous: stamens united by their filaments into one set; p. 111.
Monandrous (flower): having only one stamen; p. 112.
Moniliform: necklace-shaped; a cylindrical body contracted at intervals.
Monochlamydeous: having only one floral envelope, i. e. calyx but no corolla, as Anemone, fig. 179, and Castor-oil Plant, fig. 178.
Monocotyledonous (embryo): with only one cotyledon; p. 16, 137.
Monocotyledonous Plants, p. 150, 192.
Monœcious, or *Monoicous* (flower): having stamens or pistils only; p. 90.
Monogynous (flower): having only one pistil, or one style; p. 116.
Monopetalous (flower): with the corolla of one piece; p. 101.
Monophyllous: one-leaved, or of one piece; p. 102.
Monosepalous: a calyx of one piece; i. e. with the sepals united into one body; p. 101.
Monospermous: one-seeded.
Monstrosity: an unnatural deviation from the usual structure or form.
Morphology: the department of botany which treats of the forms which an organ (say a leaf) may assume; p. 28.
Mucronate: tipped with an abrupt short point (*mucro*); p. 60, fig. 111.
Mucronulate: tipped with a minute abrupt point; a diminutive of the last.
Multi-, in composition: many; as
Multangular: many-angled. *Multicipital:* many-headed, &c.
Multifarious: in many rows or ranks. *Multifid:* many-cleft; p. 62.
Multilocular: many-celled. *Multiserial:* in many rows.
Multiple Fruits, p. 133.
Muricate: beset with short and hard points.
Muriform: wall-like; resembling courses of bricks in a wall.
Muscology: the part of descriptive botany which treats of Mosses (i. e. *Musci*).
Muticous: pointless; beardless; unarmed.
Mycelium: the spawn of Fungi; i. e. the filaments from which Mushrooms, &c. originate.

Napiform: turnip-shaped; p. 31, fig. 57.
Natural System: p. 195.
Naturalized: introduced from a foreign country, but growing perfectly wild and propagating freely by seed.
Navicular: boat-shaped, like the glumes of most Grasses.
Necklace-shaped: looking like a string of beads; see *moniliform.*
Nectar: the honey, &c. secreted by glands, or by any part of the corolla.
Nectariferous: honey-bearing; or having a nectary.
Nectary: the old name for petals and other parts of the flower when of unusual shape, especially when honey-bearing. So the hollow spur-shaped petals of Columbine were called nectaries; also the curious long-clawed petals of Monkshood, fig. 186, &c.

Needle-shaped: long, slender, and rigid, like the leaves of Pines; p. 68, fig. 140.

Nerve: a name for the ribs or veins of leaves, when simple and parallel; p. 56.

Nerved: furnished with nerves, or simple and parallel ribs or veins; p. 56, fig. 84.

Netted-veined: furnished with branching veins forming network; p. 56, fig. 83.

Nodding (in Latin form, *Nutant*): bending so that the summit hangs downward.

Node: a knot; the "joints" of a stem, or the part whence a leaf or a pair of leaves springs; p. 40.

Nódose: knotty or knobby. *Nódulose:* furnished with little knobs or knots.

Normal: according to rule; the pattern or natural way according to some law.

Notate: marked with spots or lines of a different color.

Nucamentaceous: relating to or resembling a small nut.

Núciform: nut-shaped or nut-like. *Núcule:* a small nut.

Nucleus: the kernel of an ovule (p. 122) or seed (p. 136) of a cell; p. 140.

Nut: a hard, mostly one-seeded indehiscent fruit; as a chestnut, butternut, acorn; p. 130, fig. 299.

Nutlet: a little nut; or the stone of a drupe.

Ob- (meaning over against): when prefixed to words, signifies inversion; as,

Obcompressed: flattened the opposite of the usual way.

Obcórdate: heart-shaped with the broad and notched end at the apex instead of the base; p. 60, fig. 109.

Oblánceolate: lance-shaped with the tapering point downwards; p. 58, fig. 91.

Oblique: applied to leaves, &c. means unequal-sided.

Oblong: from two to four times as long as broad, and more or less elliptical in outline; p. 58, fig. 87.

Obóvate: inversely ovate, the broad end upward; p. 58, fig. 93.

Obtuse: blunt, or round at the end; p. 60, fig. 105.

Obverse: same as *inverse.*

Obvolute (in the bud): when the margins of one leaf alternately overlap those of the opposite one.

Óchreate: furnished with *ochreæ* (boots), or stipules in the form of sheaths; as in Polygonum, p. 69, fig. 137.

Ochroleúcous: yellowish-white; dull cream-color.

Octo-, eight, enters into the composition of

Octágynous: with eight pistils or styles.

Octámerous: its parts in eights. *Octándrous:* with eight stamens, &c.

Offset: short branches next the ground which take root; p. 38.

One-ribbed, *One-nerved*, &c.: furnished with only a single rib, &c., &c.

Opaque, applied to a surface, means dull, not shining.

Opérculate: furnished with a lid or cover (*operculum*), as the capsules of Mosses.

Opposite: said of leaves and branches when on opposite sides of the stem from each other (i. e. in pairs); p. 23, 71. Stamens are opposite the petals, &c. when they stand before them.

Orbícular, *Orbiculate:* circular in outline or nearly so; p. 58.

Organ: any member of the plant, as a leaf, a stamen, &c.; p. 1.

Organs of Vegetation, p. 7; of *Reproduction*, p. 77.

Organized, *Organic:* p. 1, 158, 159, 162.

Organic Constituents, p. 160. *Organic Structure*, p. 142.

Orthótropous or *Orthótropal* (ovule or seed): p. 122, 135, fig. 270, 274.

Osseous: of a bony texture.

Oval: broadly elliptical; p. 88.

Óvary: that part of the pistil containing the ovules or future seeds; p. 86, 116.

Óvate: shaped like an egg with the broader end downwards, or, in plane surfaces, such as leaves, like the section of an egg lengthwise; p. 58, fig. 89.

Óvoid: ovate or oval in a solid form.

Óvule: the body which is destined to become a seed; p. 86, 116, 122.

Palea (plural *paleæ*): chaff; the inner husks of Grasses; the chaff or bracts on the receptacle of many Compositæ, as Coreopsis, fig. 220, and Sunflower.

Paleaceous: furnished with chaff, or chaffy in texture.

Palmate: when leaflets or the divisions of a leaf all spread from the apex of the petiole, like the hand with the outspread fingers; p. 167, fig. 129, &c.

Palmately (veined, lobed, &c.): in a palmate manner; p. 57, 63, 65.

Pandúriform: fiddle-shaped (which see).

Pánicle: an open cluster; like a raceme, but more or less compound; p. 81, fig. 163.

Panicled, Paniculate: arranged in panicles, or like a panicle.

Papery: of about the consistence of letter-paper.

Papilionaceous: butterfly-shaped; applied to such a corolla as that of the Pea and the Locust-tree; p. 105, fig. 217.

Papílla (plural *papillæ*): little nipple-shaped protuberances.

Papíllate, Papíllose: covered with papillæ.

Pappus: thistle-down. The down crowning the achenium of the Thistle, and other Compositæ, represents the calyx; so the scales, teeth, chaff, as well as bristles, or whatever takes the place of the calyx in this family, are called the pappus; fig. 292–296, p. 130.

Parallel-veined, or *nerved* (leaves): p. 55, 56.

Paráphyses: jointed filaments mixed with the antheridia of Mosses. (Manual, p. 607.)

Paréchyma: soft cellular tissue of plants, like the green pulp of leaves.

Paríetal (placentæ, &c.): attached to the walls (*parietes*) of the ovary or pericarp; p. 119, 120.

Parted: separated or cleft into parts almost to the base; p. 62.

Partial involucre, same as an *involucel*: *partial petiole*, a division of a main leaf-stalk or the stalk of a leaflet: *partial peduncle*, a branch of a peduncle: *partial umbel*, an umbellet, p. 81.

Patent: spreading; open. *Patulous:* moderately spreading.

Pauci-, in composition: few; as *pauciflorous*, few-flowered, &c.

Pear-shaped: solid obovate, the shape of a pear.

Péctinate: pinnatifid or pinnately divided into narrow and close divisions, like the teeth of a comb.

Pedate: like a bird's foot; palmate or palmately cleft, with the side divisions again cleft, as in Viola pedata, &c.

Pedately cleft, lobed, &c.: cut in a pedate way.

Pédicel: the stalk of each particular flower of a cluster; p. 78, fig. 156.

Pédicellate, Pédicelled: furnished with a pedicel.

Péduncle: a flower-stalk, whether of a single flower or of a flower-cluster; p. 78.

Péduncled, Pedúnculate: furnished with a peduncle.

Peltate: shield-shaped: said of a leaf, whatever its shape, when the petiole is attached to the lower side, somewhere within the margin; p. 59, fig. 102, 178.

Pendent: hanging. *Pendulous:* somewhat hanging or drooping.

Penícillate: tipped with a tuft of fine hairs, like a painter's pencil; as the stigmas of some Grasses.

Penta- (in words of Greek composition): five; as

Pentágynous: with five pistils or styles; p. 116.

Pentámerous: with its parts in fives, or on the plan of five.

Pentándrous: having five stamens; p. 112. *Pentástichous:* in five ranks.

Pepo: a fruit like the Melon and Cucumber; p. 128.

Perennial: lasting from year to year; p. 21.

Perfect (flower): having both stamens and pistils; p. 89.

Perfóliate: passing through the leaf, in appearance; p. 67, fig. 131, 132.

Pérforate: pierced with holes, or with transparent dots resembling holes, as an Orange-leaf.

Périanth: the leaves of the flower generally, especially when we cannot readily distinguish them into calyx and corolla; p. 85.

Péricarp: the ripened ovary; the walls of the fruit, p. 127.

Pericárpic: belonging to the pericarp

Périchæth: the cluster of peculiar leaves at the base of the fruit-stalk of Mosses.

Perichætial: belonging to the perichæth.

Perigónium, Perigóne: same as *perianth.*

Perigýnium: bodies around the pistil; applied to the closed cup or bottle-shaped body which encloses the ovary of Sedges, and to the bristles, little scales, &c. of the flowers of some other Cyperaceæ.

Perígynous: the petals and stamens borne on the calyx; p. 104, 111.

Perípheric: around the outside, or periphery, of any organ.

Périsperm: a name for the albumen of a seed (p. 136).

Péristome: the fringe of teeth, &c. around the orifice of the capsule of Mosses. (Manual, p. 607.)

Persístent: remaining beyond the period when such parts commonly fall, as the leaves of evergreens, and the calyx, &c. of such flowers as remain during the growth of the fruit.

Pérsonate: masked; a bilabiate corolla with a projection, or *palate* in the throat, as of the Snapdragon; p. 106, fig. 210, 211.

Petal: a leaf of the corolla; p. 85.

Petaloid: petal-like; resembling or colored like petals.

Pétiole: a footstalk of a leaf; a leaf-stalk, p. 54.

Petioled, Petiolate: furnished with a petiole.

Petiólulate: said of a leaflet when raised on its own partial leafstalk.

Phænógamous, or *Phanerógamous:* plants bearing flowers and producing seeds; same as Flowering Plants; p. 177, 182.

Phyllódium (plural *phyllodia*): a leaf where the blade is a dilated petiole, as in New Holland Acacias; p. 69.

Phyllotáxis, or *Phyllotaxy:* the arrangement of leaves on the stem; p. 71.

Physiological Botany, Physiology, p. 3.

Phyton: a name used to designate the pieces which by their repetition make up a plant, theoretically, viz. a joint of stem with its leaf or pair of leaves.

Pilíferous: bearing a slender bristle or hair (*pilum*), or beset with hairs.

Pílose: hairy; clothed with soft slender hairs.

Pinna: a primary branch of the petiole of a bipinnate or tripinnate leaf, as fig. 130, p. 66.

Pínnule: a secondary branch of the petiole of a bipinnate or tripinnate leaf; p. 66.

Pínnate (leaf): when the leaflets are arranged along the sides of a common petiole; p. 65, fig. 126 – 128.

Pinnately lobed, cleft, parted, divided, &c., p. 63.

Pinnátifid: same as pinnately cleft; p. 63, fig. 119.

Pistil: the seed-bearing organ of the flower; p. 86, 116.

Pistillídium: the body which in Mosses, Liverworts, &c. answers to the pistil.

Pitchers, p. 51, fig. 79, 80.

Pith: the cellular centre of an exogenous stem; p. 150, 151.

Pitted: having small depressions or pits on the surface, as many seeds.

Placénta: the surface or part of the ovary to which the ovules are attached; p. 118.

Plaited (in the bud); p. 76, fig. 150; p. 110, fig. 225.

Plane: flat, outspread.

Plicate: same as *plaited*.

Plumose: feathery; when any slender body (such as a bristle of a pappus) is beset with hairs along its sides, like the plumes or the beard on a feather.

Plúmule: the little bud or first shoot of a germinating plantlet above the cotyledons; p. 6, fig. 5; p. 137.

Pluri-, in composition: many or several; as

Plurifoliolate: with several leaflets; p. 66.

Pod: specially a legume, p. 131; also applied to any sort of capsule.

Pódosperm: the stalk of a seed.

Pointless: destitute of any pointed tip, such as a *mucro, awn, acumination*, &c.

Pollen: the fertilizing powder of the anther; p. 86, 114.

Pollen-mass: applied to the pollen when the grains all cohere into a mass, as in Milkweed and Orchis.

Poly- (in compound words of Greek origin): same as *multi-* in those of Latin origin, viz. many; as

Polyadélphous: having the stamens united by their filaments into several bundles; p. 112.

Polyándrous: with numerous (more than 20) stamens (inserted on the receptacle); p. 112.

Polycotylédonous: having many (more than two) cotyledons, as Pines; p. 17, 137, fig. 45, 46.

Polýgamous: having some perfect and some separated flowers, on the same or on different individuals, as the Red Maple.

Polýgonal: many-angled.

Polýgynous: with many pistils or styles; p. 116.

Polýmerous: formed of many parts of each set.

Polymórphous: of several or varying forms.

Polypétalous: when the petals are distinct or separate (whether few or many); p. 103.

Polyphyllous: many-leaved; formed of several distinct pieces, as the calyx of Sedum, fig. 168, Flax, fig. 174, &c.

Polysépalous: same as the last when applied to the calyx; p. 103.

Polyspérmous: many-seeded.

Pome: the apple, pear, and similar fleshy fruits; p. 128.

Porous: full of holes or pores.

Pouch: the silicle or short pod, as of Shepherd's Purse; p. 133.

Præfloration: same as *æstivation*; p. 108.

Præfoliation: same as *vernation*; p. 75.

Præmórse: ending abruptly, as if bitten off.

Prickles: sharp elevations of the bark, coming off with it, as of the Rose; p. 39.

Prickly: bearing prickles, or sharp projections like them.

Prímine: the outer coat of the covering of the ovule; p. 124.

Primórdial: earliest formed; primordial leaves are the first after the cotyledons.

Prismátic: prism-shaped; having three or more angles bounding flat or hollowed sides.

Process: any projection from the surface or edge of a body.

Procumbent: trailing on the ground; p. 37.

Produced: extended or projecting, as the upper sepal of a Larkspur is *produced* above into a spur; p. 91, fig. 183.

Prolíferous (literally, bearing offspring): where a new branch rises from an older one, or one head or cluster of flowers out of another, as in Filago Germanica, &c.

Prostrate: lying flat on the ground.

Próteine: a vegetable product containing nitrogen; p. 165.

Prótoplasm: the soft nitrogenous lining or contents of cells; p. 165.

Prúinose, Pruinate: frosted; covered with a powder like hoar-frost.

Pubérulent: covered with fine and short, almost imperceptible down.

Pubéscent: hairy or downy, especially with fine and soft hairs or *pubescence*.

Pulvérulent, or *Pulveraceous:* dusted; covered with fine powder, or what looks like such.

Púlvinate: cushioned, or shaped like a cushion.

Punctate: dotted, either with minute holes or what look as such (as the St. John's-wort and the Orange), or with minute projecting dots.

Pungent: very hard, and sharp-pointed; prickly-pointed.

Putámen: the stone of a drupe, or the shell of a nut; p. 128.

Pyramidal: shaped like a pyramid.

Pyréne, Pyréna: a seed-like nutlet or stone of a small drupe.

Pyxis, Pyxídium: a pod opening round horizontally by a lid; p. 133, fig. 298, 311.

Quadri-, in words of Latin origin: four; as

Quadrángular: four-angled. *Quadrifoliate:* four-leaved.

Quádrifid: four-cleft; p 62.

Quatérnate: in fours. *Quinate:* in fives.

Quincúncial: in a quincunx; when the parts in æstivation are five, two of them outside, two inside, and one half out and half in, as shown in the calyx, fig. 224.

Quíntuple: five-fold.

Race: a marked variety which may be perpetuated from seed; p. 174.

Raceme: a flower-cluster, with one-flowered pedicels arranged along the sides of a general peduncle; p. 78, fig. 156.

Racemose: bearing racemes, or raceme-like.

Rachis: see *rhachis*.

Radial: belonging to the ray.

Rádiate, or *Radiant:* furnished with ray-flowers; p. 107.

Rádical: belonging to the root, or apparently coming from the root.

Rádicant: rooting, taking root on or above the ground, like the stems of Trumpet-Creeper and Poison-Ivy.

Rádicels: little roots or rootlets.

Radicle: the stem-part of the embryo, the lower end of which forms the root; p. 6, fig. 4, &c.; p. 137.

Rameal: belonging to a branch. *Ramose:* full of branches (*rami*).

Rámulose: full of branchlets (*ramuli*).

Raphe: see *rhaphe*.

Ray: the marginal flowers of a head (as of Coreopsis, p. 107, fig. 219) or cluster (as of Hydrangea, fig. 167), when different from the rest, especially when ligulate, and diverging (like rays or sunbeams); the branches of an umbel, which diverge from a centre; p. 79.

Receptacle: the axis or support of a flower; p. 86, 124; the common axis or support of a head of flowers; fig. 230.

Reclined: turned or curved downwards; nearly recumbent.

Recurved: curved outwards or backwards.

Reduplicate (in æstivation): valvate with the margins turned outwards, p. 109.

Reflexed: bent outwards or backwards.

Refracted: bent suddenly, so as to appear broken at the bend.

Regular: all the parts similar; p. 89.

Réniform: kidney-shaped; p. 58, fig. 100.

Repánd: wavy-margined; p. 62, fig. 115.

Répent: creeping, i. e. prostrate and rooting underneath.

Réplum: the persistent frame of some pods (as of Prickly Poppy and Cress), after the valves fall away.

Reproduction, organs of: all that pertains to the flower and fruit; p. 76.

Resúpinate: inverted, or appearing as if upside down, or reversed.

Reticulated: the veins forming network, as in fig. 50, 83.

Retroflexed: bent backwards; same as *reflexed*.

Retúse: blunted; the apex not only obtuse, but somewhat indented; p. 60, fig. 107.

Révolute: rolled backwards, as the margins of many leaves; p. 76.

Rhachis (the backbone): the axis of a spike, or other body; p. 78.

Rhaphe: the continuation of the seed-stalk along the side of an anatropous ovule (p. 123) or seed; fig. 273, *r*, 319 and 320, *b*.

Rháphides: crystals, especially needle-shaped ones, in the tissues of plants.

Rhizóma: a rootstock; p. 40, fig. 64–67.

Rhombic: in the shape of a rhomb. *Rhomboidal:* approaching that shape.

Rib: the principal piece, or one of the principal pieces, of the framework of a leaf, p. 55; or any similar elevated line along a body.

Ring: an elastic band on the spore-cases of Ferns. (Manual, p. 587, plate 9, fig. 2, 3.)

Ringent: grinning; gaping open; p. 102, fig. 209.

Root, p. 28.

Root-hairs, p. 31, 149.

Rootlets: small roots, or root-branches; p. 29.

Rootstock: root-like trunks or portions of stems on or under ground; p. 40.

Rosaceous: arranged like the petals of a rose.

Rostéllate: bearing a small beak (*rostellum*).

Róstrate: bearing a beak (*rostrum*) or a prolonged appendage.

Rósulate: in a regular cluster of spreading leaves, resembling a full or double rose, as the leaves of Houseleek, &c.

Rótate: wheel-shaped: p. 101, fig. 204, 205.

Rotund: rounded or roundish in outline.

Rudimentary: imperfectly developed, or in an early state of development.

Rúgose: wrinkled, roughened with wrinkles.

Rúminated (albumen): penetrated with irregular channels or portions filled with softer matter, as a nutmeg.

Rúncinate: coarsely saw-toothed or cut, the pointed teeth turned towards the base of the leaf, as the leaf of a Dandelion.

Runner: a slender and prostrate branch, rooting at the end, or at the joints, as of a Strawberry, p. 38.

Sac: any closed membrane, or a deep purse-shaped cavity.

Ságittate: arrowhead-shaped; p. 59, fig. 95.

Salver-shaped, or *Salver-form:* with a border spreading at right angles to a slender tube, as the corolla of Phlox, p. 101, fig. 208, 202.

Samára: a wing-fruit, or key, as of Maple, p. 5, fig. 1, Ash, p. 131, fig. 300, and Elm, fig. 301.

Sámaroid: like a samara or key-fruit.

Sap: the juices of plants generally. Ascending or crude sap; p. 161, 168. Elaborated sap, that which has been digested or assimilated by the plant; p. 162, 169.

Sárcocarp: the fleshy part of a stone-fruit, p. 128.

Sarmentáceous: bearing long and flexible twigs (*sarments*), either spreading or procumbent.

Saw-toothed: see *serrate*.

Scábrous: rough or harsh to the touch.

Scaláriform: with cross-bands, resembling the steps of a ladder.

Scales: of buds, p. 22, 50; of bulbs, &c., p. 40, 46, 50.

Scaly: furnished with scales, or scale-like in texture; p. 46, &c.

Scandent: climbing; p. 37.

Scape: a peduncle rising from the ground, or near it, as of the stemless Violets, the Bloodroot, &c.

Scápiform: scape-like.

Scar of the seed, p. 135. *Leaf-scars,* p. 21.

Scárious or *Scariose:* thin, dry, and membranous.

Scobiform: resembling sawdust.

Scórpioid or *Scorpioidal* : curved or circinate at the end, like the tail of a scorpion, as the inflorescence of Heliotrope.

Scrobículate : pitted ; excavated into shallow pits.

Scurf, Scurfiness : minute scales on the surface of many leaves, as of Goosefoot, Buffalo-berry, &c.

Scútate : buckler-shaped.

Scutéllate, or *Scutélliform* : saucer-shaped or platter-shaped.

Sécund : one-sided ; i. e. where flowers, leaves, &c. are all turned to one side.

Secúndine : the inner coat of the ovule ; p. 124.

Seed, p. 134. *Seed-coats*, p. 134. *Seed-vessel*, p. 127.

Segment : a subdivision or lobe of any cleft body.

Ségregate : separated from each other.

Semi- (in compound words of Latin origin) : half ; as

Semi-adherent, as the calyx or ovary of Purslane, fig. 214. *Semicordate* : half-heart-shaped. *Semilunar* : like a half-moon. *Semiovate* : half-ovate, &c.

Seminal : relating to the seed. *Seminíferous* : seed-bearing.

Sempérvirent : evergreen.

Sepal : a leaf or division of the calyx ; p. 85.

Sépaloid : sepal-like. *Sepaline* : relating to the sepals.

Separated Flowers : those having stamens or pistils only ; p. 89.

Septate : divided by partitions (*septa*).

Séptenate : with parts in sevens.

Septicídal : where a pod in dehiscence splits through the partitions, dividing each into two layers ; p. 132, fig. 306.

Septíferous : bearing the partition.

Septífragal : where the valves of a pod in dehiscence break away from the partitions ; p. 132.

Septum (plural *septa*) : a partition, as of a pod, &c.

Sérial, or *Seriate* : in rows ; as *biserial*, in two rows, &c.

Seríceous : silky ; clothed with satiny pubescence.

Serótinous : happening late in the season.

Serrate, or *Serrated* : the margin cut into teeth (*serratures*) pointing forwards ; p. 61, fig. 112.

Sérrulate : same as the last, but with fine teeth.

Sessile : sitting ; without any stalk, as a leaf destitute of petiole, or an anther destitute of filament.

Seta : a bristle, or a slender body or appendage resembling a bristle.

Setáceous : bristle-like. *Sétiform* : bristle-shaped.

Setígerous : bearing bristles. *Setose* : beset with bristles or bristly hairs.

Sex : six ; in composition. *Sexangular* : six-angled, &c.

Sheath : the base of such leaves as those of Grasses, which are

Sheathing : wrapped round the stem.

Shield-shaped : same as *scutate*, or as *peltate*, p 59.

Shrub, p. 21.

Sigmoid : curved in two directions, like the letter S, or the Greek *sigma*.

Silículose : bearing a silicle, or a fruit resembling it.

Sílicle : a pouch, or short pod of the Cress Family ; p. 133.

Silíque : a longer pod of the Cress Family ; p. 133, fig. 310.

Siliquose: bearing siliques or pods which resemble siliques.

Silky: glossy with a coat of fine and soft, close-pressed, straight hairs.

Silver-grain of wood, p. 151.

Silvery: shining white or bluish-gray, usually from a silky pubescence.

Simple: of one piece; opposed to *compound*.

Sinistrorse: turned to the left.

Sinuate: strongly wavy; with the margin alternately bowed inwards and outwards; p. 62, fig. 116.

Sinus: a recess or bay; the re-entering angle or space between two lobes or projections.

Sleep of Plants (so called), p. 170.

Soboliferous: bearing shoots from near the ground.

Solitary: single; not associated with others.

Sorus (plural *sori*): the proper name of a fruit-dot of Ferns.

Spadix: a fleshy spike of flowers; p. 80, fig. 162.

Spathaceous: resembling or furnished with a

Spathe: a bract which inwraps an inflorescence; p. 80, fig. 162.

Spátulate, or *Spathulate*: shaped like a spatula; p. 58, fig. 92.

Special Movements, p. 170.

Species, p. 173.

Specific Character, p. 181. *Specific Names*, p. 179.

Spicate: belonging to or disposed in a spike.

Spíciform: in shape resembling a spike.

Spike: an inflorescence like a raceme, only the flowers are sessile; p. 80, fig. 160.

Spikelet: a small or a secondary spike; the inflorescence of Grasses.

Spine: a thorn; p. 39.

Spindle-shaped: tapering to each end, like a radish; p. 31, fig. 59.

Spinescent: tipped by or degenerating into a thorn.

Spinose, or *Spiniferous*: thorny.

Spiral arrangement of leaves, p. 72. *Spiral vessels or ducts*, p. 148.

Sporángia, or *Spórocarps*: spore-cases of Ferns, Mosses, &c.

Spore: a body resulting from the fructification of Cryptogamous plants, in them taking the place of a seed.

Spórule: same as a spore, or a small spore.

Spur: any projecting appendage of the flower, looking like a spur, as that of Larkspur, fig. 183.

Squamate, *Squamose*, or *Squamaceous*: furnished with scales (*squamæ*).

Squamellate or *Squámulose*: furnished with little scales (*squamellæ* or *squamulæ*).

Squámiform: shaped like a scale.

Squarrose: where scales, leaves, or any appendages, are spreading widely from the axis on which they are thickly set.

Squárrulose: diminutive of *squarrose*; slightly squarrose.

Stalk: the stem, petiole, peduncle, &c., as the case may be.

Stamen, p. 86, 111.

Staminate: furnished with stamens; p. 89. *Stamineal*: relating to the stamens.

Staminódium: an abortive stamen, or other body resembling a sterile stamen.

Standard: the upper petal of a papilionaceous corolla; p. 105, fig. 217, 218, s.

Starch: a well-known vegetable product; p. 163.

Station: the particular place, or kind of situation, in which a plant naturally occurs.

Stéllate, Stéllular: starry or star-like; where several similar parts spread out from a common centre, like a star.

Stem, p. 36, &c.

Stemless: destitute or apparently destitute of stem.

Sterile: barren or imperfect; p. 89.

Stigma: the part of the pistil which receives the pollen; p. 87.

Stigmátic, or *Stigmatose:* belonging to the stigma.

Stipe (Latin *stipes*) · the stalk of a pistil, &c., when it has any; the stem of a Mushroom.

Stipel: a stipule of a leaflet, as of the Bean, &c.

Stipéllate: furnished with stipels, as the Bean and some other Leguminous plants.

Stípitate: furnished with a stipe, as the pistil of Cleome, fig. 276.

Stípulate: furnished with stipules.

Stipules: the appendages one each side of the base of certain leaves; p. 69.

Stolons: trailing or reclined and rooting shoots; p. 37.

Stoloníferous: producing stolons.

Stomate (Latin *stoma,* plural *stomata*): the breathing-pores of leaves, &c.; p. 156.

Strap-shaped: long, flat, and narrow; p. 106.

Striate, or *Striated:* marked with slender longitudinal grooves or channels (Latin *striæ*).

Strict: close and narrow; straight and narrow.

Strigíllose, Strigose: beset with stout and appressed, scale-like or rigid bristles.

Strobiláceous: relating to, or resembling a

Stróbile: a multiple fruit in the form of a cone or head, as that of the Hop and of the Pine; fig. 314, p. 133.

Stróphiole: same as *caruncle.* *Strophiolate:* furnished with a strophiole.

Struma: a wen; a swelling or protuberance of any organ.

Style: a part of the pistil which bears the stigma; p. 86.

Stylopódium: an epigynous disk, or an enlargement at the base of the style, found in Umbelliferous and some other plants.

Sub-, as a prefix: about, nearly, somewhat; as *subcordate,* slightly cordate: *subserrate,* slightly serrate: *subaxillary,* just beneath the axil, &c., &c.

Súberose: corky or cork-like in texture.

Subclass, p. 177, 183. *Suborder,* p. 176. *Subtribe,* p. 177.

Súbulate: awl-shaped; tapering from a broadish or thickish base to a sharp point; p. 68.

Succulent: juicy or pulpy.

Suckers: shoots from subterranean branches; p. 37.

Suffrutéscent: slightly shrubby or woody at the base only; p. 36.

Sugar, p. 163.

Sulcate: grooved longitudinally with deep furrows.

Supernumerary Buds: p. 26.

Supérvolute: plaited and convolute in bud; p 110, fig. 225.

Supra-axillary: borne above the axil, as some buds; p. 26, fig. 52.

Supra-decompound: many times compounded or divided.

Súrculose: producing suckers, or shoots resembling them.

Suspended: hanging down. Suspended ovules or seeds hang from the very summit of the cell which contains them; p. 122, fig. 269.

Sútural: belonging or relating to a suture.

Súture: the line of junction of contiguous parts grown together; p. 117.

Sword-shaped: vertical leaves with acute parallel edges, tapering above to a point; as those of Iris, fig. 133.

Symmetrical Flower: similar in the number of parts of each set; p. 89.

Synántherous, or *Syngenesious:* where stamens are united by their anthers; p. 112, fig. 229.

Syncárpous (fruit or pistil): composed of several carpels consolidated into one.

System, p. 195.

Systematic Botany: the study of plants after their kinds; p. 3.

Taper-pointed: same as *acuminate;* p. 60, fig. 103.

Tap-root: a root with a stout tapering body; p. 32.

Tawny: dull yellowish, with a tinge of brown.

Taxónomy: the part of Botany which treats of classification.

Tégmen: a name for the inner seed-coat.

Tendril: a thread-shaped body used for climbing, p. 38: it is either a branch, as in Virginia Creeper, fig. 62; or a part of a leaf, as in Pea and Vetch, fig. 127.

Térete: long and round; same as *cylindrical,* only it may taper.

Términal: borne at, or belonging to, the extremity or summit.

Terminólogy: the part of the science which treats of technical terms; same as *glossology.*

Térnate: in threes; p. 66. *Ternately:* in a ternate way.

Testa: the outer (and usually the harder) coat or shell of the seed; p. 134.

Tetra- (in words of Greek composition): four; as,

Tetracóccous: of four cocci or carpels.

Tetradýnamous: where a flower has six stamens, two of them shorter than the other four, as in Mustard, p. 92, 112, fig. 188.

Tetrágonal: four-angled. *Tetrágynous:* with four pistils or styles; p. 116.

Tetrámerous: with its parts or sets in fours.

Tetrándrous: with four stamens; p. 112.

Theca: a case; the cells or lobes of the anther.

Thorn: see *spine;* p. 39.

Thread-shaped: slender and round, or roundish like a thread; as the filament of stamens generally.

Throat: the opening or gorge of a monopetalous corolla, &c., where the border and the tube join, and a little below.

Thyrse or *Thyrsus:* a compact and pyramidal panicle; p. 81.

Tómentose: clothed with matted woolly hairs (*tomentum*).

Tongue-shaped: long, flat, but thickish, and blunt.

Toothed: furnished with teeth or short projections of any sort on the margin; used especially when these are sharp, like saw-teeth, and do not point forwards; p. 61, fig. 113.

Top-shaped: shaped like a top, or a cone with its apex downwards.

Tórose, *Tórulose:* knobby; where a cylindrical body is swollen at intervals.

Torus: the receptacle of the flower; p. 86, 124.

Tree, p. 21.

Tri-, in composition: three; as

Triadélphous: stamens united by their filaments into three bundles; p. 112.

Triándrous: where the flower has three stamens; p. 112.

Tribe, p. 176.

Trichótomous: three-forked. *Tricóccous:* of three cocci or roundish carpels.

Trícolor: having three colors. *Tricóstate:* having three ribs.

Tricúspidate: three-pointed. *Tridéntate:* three-toothed.

Triénnial: lasting for three years.

Trifárious: in three vertical rows; looking three ways.

Tríſid: three-cleft; p. 62.

Trifóliate: three-leaved. *Trifóliolate:* of three leaflets; p. 66.

Trifúrcate: three-forked. *Trígonous:* three-angled, or triangular.

Trígynous: with three pistils or styles; p. 116. *Tríjugate:* in three pairs (*jugi*).

Trilóbed, or *Trilobate:* three-lobed; p. 62.

Trilócular: three-celled, as the pistils or pods in fig. 225–227.

Trímerous: with its parts in threes, as Trillium, fig. 189.

Trinérvate: three-nerved, or with three slender ribs.

Triœ́cious: where there are three sorts of flowers on the same or different individuals; as in Red Maple.

Tripártible: separable into three pieces. *Tripártite:* three-parted; p. 62.

Tripétalous: having three petals; as in fig. 189.

Triphýllous: three-leaved; composed of three pieces.

Tripínnate: thrice pinnate; p. 66. *Tripinnátifid:* thrice pinnately cleft; p. 64.

Triple-ribbed, *Triple-nerved*, &c.: where a midrib branches into three near the base of the leaf, as in Sunflower.

Triquétrous: sharply three-angled; and especially with the sides concave, like a bayonet.

Trisérial, or *Triseriate:* in three rows, under each other.

Trístichous: in three longitudinal or perpendicular ranks.

Tristigmátic, or *Tristigmatose:* having three stigmas.

Trisúlcate: three-grooved.

Tritérnate: three times ternate; p. 67.

Trivial Name: the specific name.

Tróchlear: pulley-shaped.

Trumpet-shaped: tubular, enlarged at or towards the summit, as the corolla of Trumpet-Creeper.

Truncate: as if cut off at the top; p. 60, fig. 106.

Tube, p. 102.

Trunk: the main stem or general body of a stem or tree.

Tuber: a thickened portion of a subterranean stem or branch, provided with eyes (buds) on the sides; as a potato, p 43, fig. 68.

Túbercle: a small excrescence.

Tubercled, or *Tuberculate:* bearing excrescences or pimples.

Túberous: resembling a tuber. *Tuberiferous:* bearing tubers.

Túbular: hollow and of an elongated form; hollowed like a pipe.

Tumid: swollen; somewhat inflated.
Túnicate: coated; invested with layers, as an onion; p. 46.
Túrbinate: top-shaped. *Turgid:* thick as if swollen.
Túrio (plural *turiones*): young shoots or suckers springing out of the ground; as Asparagus-shoots.
Turnip-shaped: broader than high, narrowed below; p. 32, fig. 57.
Twin: in pairs (see *geminate*), as the flowers of Linnæa
Twining: ascending by coiling round a support, like the Hop; p. 37.
Typical: well expressing the characteristics of a species, genus, &c.

Úmbel: the umbrella-like form of inflorescence; p. 79, fig. 159.
Umbéllate: in umbels. *Umbellíferous:* bearing umbels.
Úmbellet: a secondary or partial umbel; p. 81.
Umbílicate: depressed in the centre, like the ends of an apple.
Úmbonate: bossed; furnished with a low, rounded projection like a boss (*umbo*).
Umbráculiform: umbrella-shaped, like a Mushroom, or the top of the style of Sarracenia.
Unarmed: destitute of spines, prickles, and the like.
Úncinate: hook-shaped; hooked over at the end.
Under-shrub: partially shrubby, or a very low shrub.
Úndulate: wavy, or wavy-margined; p. 62.
Unequally pinnate: pinnate with an odd number of leaflets; p. 65.
Unguículate: furnished with a claw (*unguis*); p. 102, i. e. a narrow base, as the petals of a Rose, where the claw is very short, and those of Pinks (fig. 200), where the claw is very long.
Uni-, in compound words: one; as
Uniflórous: one-flowered. *Unifóliate:* one-leaved.
Unifóliolate: of one leaflet; p. 66. *Unijugate:* of one pair.
Unilábiate: one-lipped. *Unilateral:* one-sided.
Unilócular: one-celled, as the pistil in fig. 261, and the anther in fig. 238, 239.
Unióvulate: having only one ovule, as in fig. 213, and fig. 267–269.
Unisérial: in one horizontal row.
Uniséxual: having stamens or pistils only, as in Moonseed, fig. 176, 177, &c.
Únivalved: a pod of only one piece after dehiscence, as fig. 253.
Urcéolate: urn-shaped.
Útricle: a small, thin-walled, one-seeded fruit, as of Goosefoot; p. 130, fig. 350.
Utrícular: like a small bladder.

Váginate: sheathed, surrounded by a sheath (*vagina*).
Valve: one of the pieces (or doors) into which a dehiscent pod, or any similar body, splits; p. 131, 114.
Valvate, Válvular: opening by valves. *Valvate* in æstivation, p. 109.
Variety, p. 174, 177.
Váscular: containing vessels, or consisting of vessels, such as ducts; p. 146, 148.
Vaulted: arched; same as *fornicate.*
Vegetable Physiology, p. 3.
Veil: the calyptra of Mosses. (Manual, p. 607)
Veins: the small ribs or branches of the framework of leaves, &c.; p. 55.

Veined, Veiny: furnished with evident veins. *Veinless*: destitute of veins.

Veinlets: the smaller ramifications of veins.

Velate: furnished with a veil.

Velútinous: velvety to the touch.

Venation: the veining of leaves, &c.; p. 55.

Vénose: veiny; furnished with conspicuous veins.

Ventral: belonging to that side of a simple pistil, or other organ, which looks towards the axis or centre of the flower; the opposite of dorsal; as the *Ventral Suture*, p. 117.

Véntricose: inflated or swelled out on one side.

Vénulose: furnished with veinlets.

Vermícular: shaped like worms.

Vernation: the arrangement of the leaves in the bud; p. 75.

Vérnicose: the surface appearing as if varnished.

Vérrucose: warty; beset with little projections like warts.

Vérsatile: attached by one point, so that it may swing to and fro, as the anthers of the Lily and Evening Primrose; p. 113, fig. 234.

Vertex: same as the *apex*.

Vértical: upright; perpendicular to the horizon, lengthwise.

Vérticil: a whorl; p. 71. *Verticillate*: whorled; p. 71, 75, fig. 148

Vésicle: a little bladder. *Embryonal Vesicle*, p. 139. *Vesicular*: bladdery.

Vessels: ducts, &c.; p. 146, 148.

Véxillary, Vexillar: relating to the

Vexíllum: the standard of a papilionaceous flower; p. 105, fig. 218, *s*.

Víllose: shaggy with long and soft hairs (*villosity*.)

Viminéous: producing slender twigs, such as those used for wicker-work.

Vine: any trailing or climbing stem; as a Grape-vine.

Viréscent, Viridescent: greenish; turning green.

Vírgate: wand-shaped, as a long, straight, and slender twig.

Viscous, Viscid: having a glutinous surface.

Vitta (plural *vittæ*): the oil-tubes of the fruit of Umbelliferæ.

Vóluble: twining, as the stem of Hops and Beans; p. 37.

Wavy: the surface or margin alternately convex and concave; p. 62.

Waxy: resembling beeswax in texture or appearance.

Wedge-shaped: broad above, and tapering by straight lines to a narrow base; p. 58, fig. 94.

Wheel-shaped: see *rotate*; p. 102, fig. 204, 205.

Whorl, Whorled: when leaves, &c. are arranged in a circle round the stem, p. 71, 75, fig. 148.

Wing: any membranous expansion. *Wings* of papilionaceous flowers, p. 105.

Winged: furnished with a wing; as the fruit of Ash and Elm, fig. 300, 301.

Wood, p. 145. *Woody*: of the texture or consisting of wood.

Woody Fibre, or *Wood-Cells*, p. 146.

Woolly: clothed with long and entangled soft hairs; as the leaves of Mullein.

THE END.

FIELD, FOREST, AND GARDEN

BOTANY.

Field, Forest, and Garden

BOTANY,

A SIMPLE INTRODUCTION TO THE

COMMON PLANTS OF THE UNITED STATES

EAST OF THE MISSISSIPPI,

BOTH WILD AND CULTIVATED.

By ASA GRAY,

FISHER PROFESSOR OF NATURAL HISTORY IN HARVARD UNIVERSITY.

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PREFACE.

THIS book is intended to furnish botanical classes and beginners generally with an easier introduction to the plants of this country than is the *Manual*, and one which includes the common cultivated as well as the native species. It is made more concise and simple, 1. by the use of somewhat less technical language; 2. by the omission, as far as possible, of the more recondite and, for the present purpose, less essential characters; and also of most of the obscure, insignificant, or rare plants which students will not be apt to meet with or to examine, or which are quite too difficult for beginners; such as the Sedges, most Grasses, and the crowd of Golden Rods, Asters, Sunflowers, and the like, which require very critical study. On the other hand, this small volume is more comprehensive than the Manual, since it comprises the common herbs, shrubs, and trees of the Southern as well as the Northern and Middle States, and all which are commonly cultivated or planted, for ornament or use, in fields, gardens, pleasure-grounds, or in house-culture, including even the conservatory plants ordinarily met with.

It is very desirable that students should be able to use exotic as well as indigenous plants in analysis; and a scientific acquaintance with the plants and flowers most common around us in garden, field, and green-house, and which so largely contribute to our well-being and enjoyment, would seem to be no less important than in the case of our native plants. If it is worth while so largely to assemble around us ornamental and useful trees, plants, and flowers, it is certainly well to know what they are and what they are like. To students in agricultural schools and colleges this kind of knowledge will be especially important.

One of the main objects of this book is to provide cultivators, gardeners, and amateurs, and all who are fond of plants and flowers, with a simple guide to a knowledge of their botanical names and

structure. There is, I believe, no sufficient work of this kind in the English language, adapted to our needs, and available even to our botanists and botanical teachers, — for whom the only recourse is to a botanical library beyond the reach and means of most of these, and certainly quite beyond the reach of those whose needs I have here endeavored to supply, so far as I could, in this small volume. The great difficulties of the undertaking have been to keep the book within the proper compass, by a rigid exclusion of all extraneous and unnecessary matter, and to determine what plants, both native and exotic, are common enough to demand a place in it, or so uncommon that they may be omitted. It is very unlikely that I can have chosen wisely in all cases and for all parts of the country, and in view of the different requirements of botanical students on the one hand and of practical cultivators on the other, — the latter commonly caring more for made varieties, races, and crosses, than for species, which are the main objects of botanical study. But I have here brought together, within less than 350 pages, brief and plain botanical descriptions or notices of 2,650 species, belonging to 947 genera; and have constructed keys to the natural families, and analyses of their contents, which I hope may enable students, who have well studied the *First Lessons*, to find out the name, main characters, and place of any of them which they will patiently examine in blossom and, when practicable, in fruit also. If the book answers its purpose reasonably well, its shortcomings as regards cultivated plants may be made up hereafter. As to the native plants omitted, they are to be found, and may best be studied, in the *Manual of the Botany of the Northern United States*, and in Chapman's *Flora of the Southern United States*.

This book is designed to be the companion of the *First Lessons in Botany*, which serves as grammar and dictionary; and the two may be bound together into one compact volume, forming a comprehensive *School Botany*.

For the account of the Ferns and the allied families of Cryptogamous Plants I have to record my indebtedness to Professor D. C. Eaton of Yale College. These beautiful plants are now much cultivated by amateurs; and the means here so fully provided for studying them will doubtless be appreciated.

HARVARD UNIVERSITY HERBARIUM,
Cambridge, Massachusetts, August 29, 1868.

*** In revising the sheets for the present impression, many small errors of the press, most of them relating to accentuation, have now been corrected.

January, 1870.

SIGNS AND ABBREVIATIONS.

The Signs and Abbreviations employed in this work are few. The signs are :

① for an annual plant.
② " a biennial plant.
♃ " a perennial plant.

The signs for degrees, minutes, and seconds are used for feet, inches, and lines, the latter twelve to the inch.

Thus 1° means a foot in length or height, &c.; 2′, two inches; 3″, three lines, or a quarter of an inch. The latter sign is seldom used in this work.

The dash between two figures, as "5 – 10," means from five to ten, &c.

"Fl." stands for flowers or flowering.
"Cult." " for cultivated.
"Nat." " for naturalized.
"N., E., S., W." for North, East, South, and West.

The geographical abbreviations, such as "Eu." for Europe, and the common abbreviations for the names of the States, need no particular explanation.

ANALYTICAL KEY

TO THE

NATURAL ORDERS OR FAMILIES.

Plants producing true flowers and seeds. . . . . SERIES I. PHÆNOGAMOUS OR FLOWERING, p. 33

Not producing flowers, propagated by spores. . . . . . . SERIES II. CRYPTOGAMOUS OR FLOWERLESS, p. 359

SERIES I. PHÆNOGAMOUS OR FLOWERING PLANTS.

With wood in a circle or in concentric annual circles or layers around a central pith; netted-veined **leaves**; and parts of the flower mostly in fives or fours. (See p. 33.)

CLASS I. EXOGENOUS OR DICOTYLEDONOUS PLANTS, p. 13

With wood in separate threads scattered through the diameter of the stem, not in a circle, no annual circles or layers; leaves mostly parallel-veined; and parts of the flower *almost* always in threes, never in fives. (See p. 316.) CLASS II. ENDOGENOUS OR MONOCOTYLEDONOUS PLANTS, p. 13

CLASS I. EXOGENOUS OR DICOTYLEDONOUS PLANTS.

With pistil of the ordinary sort, the ovules in a closed ovary. (Cotyledons a pair.) . . . SUBCLASS I. ANGIOSPERMOUS, p. 33

With both calyx and corolla, the latter of wholly separate petals. . . . . . I. POLYPETALOUS DIVISION, p. 14

With both calyx and corolla, the latter united more or less into one piece. . . II. MONOPETALOUS DIVISION, p. 20

Without corolla, i. e. with only one sort of floral envelope, or even none at all. . . III. APETALOUS DIVISION, p. 24

Without proper pistil, the ovules naked on a scale or on the end of a short axis: cotyledons often more than two in a whorl. . . . . SUBCLASS II. GYMNOSPERMOUS, p. 27

CLASS II. ENDOGENOUS OR MONOCOTYLEDONOUS PLANTS.

With flowers on a spadix or fleshy spike, perianth none or not corolla-like, and no glumes. I. SPADICEOUS DIVISION, p. 28

With flowers not on a spadix, and perianth or part of it more or less corolla-like. . . II. PETALOIDEOUS DIVISION, p. 28

With flowers enveloped by glumes (chaffy bracts), and no manifest perianth. . . . III. GLUMACEOUS DIVISION, p. 30

SERIES II. CRYPTOGAMOUS OR FLOWERLESS PLANTS.

Having stems with woody matter in them, also in the leaves. . . Class III. ACROGENOUS PLANTS, OR ACROGENS, p. 30

(The lower classes, of cellular plants, destitute of woody matter, including Mosses, Lichens, Sea-Weeds, and Fungi, are here omitted.)

I. POLYPETALOUS DIVISION OF EXOGENS.

A. *Stamens more than 10, and more than twice the number of the sepals or divisions of the calyx.*

Stamens monadelphous, united with the base of the corolla : anthers kidney-shaped, one-celled. . . . . MALLOW FAMILY, 70
Stamens monadelphous at base : anthers two-celled : leaves twice pinnate. . . . . MIMOSA F. 99
Stamens monadelphous at base : anthers two-celled : leaves not pinnate.
  Leaves with joint between petiole and blade, which is translucent-dotted. . . . . Citrus, RUE F. 81
  Leaves without a joint and not translucent-dotted. . . . . CAMELLIA F. 75
Stamens not monadelphous.
  Pistils numerous, but imbricated over each other and cohering in a mass on a long receptacle. . . . . MAGNOLIA F. 42
  Pistils several immersed in hollows in a top-shaped receptacle. . . . . Nelumbium, WATER-LILY F. 46
  Pistils numerous and separate, at least their ovaries, but concealed in a hollow fleshy receptacle,
    Which bears sepals or bracts over its surface : leaves simple, opposite. . . . . CALYCANTHUS F. 130
    Which is naked and imitates an inferior ovary : leaves alternate, compound. . . . . Rose, ROSE F. 115
  Pistils numerous or more than one, separate, on the receptacle.
    Stamens borne on the calyx. . . . . ROSE F. 115
    Stamens borne on the receptacle.
      Leaves centrally peltate : aquatic herb. . . . . Brasenia, WATER-LILY F. 46
      Leaves peltate near the margin : woody climber. . . . . MOONSEED F. 44
      Leaves not peltate, quite entire : trees or shrubs.
        Spicy-anise-scented : petals numerous : seed solitary. . . . . Illicium, MAGNOLIA F. 42
        Unpleasantly scented when bruised : petals 6 in 2 ranks : seeds several. . . . . . CUSTARD-APPLE F. 43
      Leaves not peltate : herbs, or if woody-stemmed the leaves are compound. . . . . CROWFOOT F. 33
  Pistil as to ovary one below but 3 – several-lobed or horned at the top.
    Not fleshy plants : petals unequal, cut or cleft : pod 1-celled, many-seeded. . . . . . . MIGNONETTE F. 57
    Not fleshy : pod several-celled, several-seeded. . . . . Nigella, CROWFOOT F. 33
    Fleshy plants : petals equal, narrow, entire. . . . . FIG-MARIGOLD F. 156

Pistil one, completely so as to the ovary, which is
- One-celled and with one parietal placenta, or otherwise showing that the pistil is of a single carpel.
  - Shrubs or trees: leaves twice pinnate or else phyllodia: fruit a pod. . . . . *Acacia*, PULSE F. 94
  - Shrubs or trees: leaves simple: stone fruit. . . . . *Prunus*, ROSE F. 115
  - Herbs; with 1-flowered 1 – 2-leaved stems: leaves peltate. . . . . Podophyllum, BARBERRY F. 44
  - Herbs; with flowers in racemes, &c.: leaves not peltate. . . . . CROWFOOT F. 33
- One-celled, with two or more parietal *placentæ*.
  - Calyx free from the ovary: stamens on the receptacle.
    - Leaves punctate with pellucid and dark dots, opposite, entire. . . . . . . ST. JOHN'S WORT F. 61
    - Leaves not punctate.
      - Calyx persistent, of 5 unequal sepals. . . . . ROCK-ROSE F. 60
      - Calyx deciduous, of 4 sepals: petals 4. . . . . Polanisia, CAPER F. 56
      - Calyx falling when the corolla opens or before: petals more numerous than the (mostly 2) sepals. POPPY F. 48
  - Calyx coherent with the ovary.
    - Fleshy and leafless, often prickly plants. . . . . CACTUS F. 152
    - Leafy herbs, rough or bristly, the hairs sometimes stinging. . . . . LOASA F. 151
- Two – several-celled, or when 1-celled the ovules not parietal.
  - Leaves *punctate* with both dark and pellucid dots, opposite: ovary superior. . . . . . ST. JOHN'S WORT F. 61
  - Leaves punctate with pellucid dots, not jointed with their stalk: ovary inferior. . . . . . . MYRTLE F. 149
  - Leaves punctate with pellucid dots, alternate, jointed with their stalk: ovary superior. . . . . . . RUE F. 81
  - Leaves not punctate with pellucid dots, and
    - All at the root, in the form of pitchers or tubes. . . . . PITCHER-PLANT F. 47
    - All at the root, bearing a fly-trap at the end. . . . . SUNDEW F. 59
    - All from prostrate rootstocks or tubers under water, mostly peltate or rounded, equal-sided. WATER-LILY F. 46
    - On the rootstock or tuber, or alternate on stems, unequal-sided, succulent: flowers monœcious. BEGONIA F. 161
    - On herbaceous stems, succulent: pod 1-celled. . . . . PURSLANE F. 69
    - On woody stems (trees or shrubs), of ordinary *conformation*.
      - Stamens on the receptacle, mostly in 5 clusters: calyx valvate in the bud: stipules (often deciduous). LINDEN F. 75

Stamens in 5 clusters, one on the base of each petal: calyx imbricated in the bud: no stipules.
- Ovary superior, 5-celled. . . . . CAMELLIA F. 75
- Ovary partly inferior, becoming one-celled and one-seeded. . . . . STORAX F. 220

Stamens separate: leaves alternate, mostly with stipules. . . . . PEAR F. 117

Stamens separate: leaves opposite or some of them scattered: no stipules.
- Calyx-tube or cup wholly adherent to the 3–5-celled ovary. . . . . . SAXIFRAGE F. 131
- Calyx-cup extended beyond the free or adherent few–many-celled ovary. . . LOOSESTRIFE F. 149

B. *Stamens not exceeding* 10, *or if so not more than twice the number of the sepals or divisions of the calyx.*

1. ***Calyx free from** the two or more separate or nearly separate ovaries.*
- Woody twiners, with diœcious flowers, separate stamens opposite as many petals, and few pistils. . . . . MOONSEED F. 44
- Woody twiners, with monœcious flowers, united stamens, and many pistils in a head, in fruit scattered in a spike. MAGNOLIA F. 42
- Tree, with diœcious or polygamous flowers, pinnate leaves, and few winged fruits. . . . . QUASSIA F. 83
- Trees, with diœcious or herbs with perfect flowers: leaves pinnate, pellucid-dotted, strong-scented or aromatic. . . RUE F. 81
- Herbs or shrubs: leaves not pellucid-dotted: flowers chiefly perfect.
  - Succulent or fleshy plants: pistils, petals, and sepals all equal in number. . . . . ORPINE F. 137
  - Not succulent nor fleshy-thickened.
    - Stamens inserted on the calyx: leaves alternate. . . . . ROSE F. 115, & SAXIFRAGE F. 131
    - Stamens inserted on a disk adhering to bottom of the calyx: leaves opposite, compound. Staphylea, SOAPBERRY F. 88
    - Stamens inserted on the receptacle. . . . . CROWFOOT F. 33

2. *Calyx free from the single (simple or compound) ovary; i. e. ovary superior.*
- Stamens of the same number as the petals and opposite them.
  - Anthers opening by uplifted valves: ovary simple, 1-celled. . . . . BARBERRY F. 44
  - Anthers opening lengthwise.
    - Ovary 1-celled, 1-ovuled: styles 5. . . . . LEADWORT F. 222
    - Ovary 1-celled, with several ovules on a central placenta.
      - Style and stigma only one: calyx persistent. . . . . PRIMROSE F. 222
      - Style or stigma cleft or lobed: calyx deciduous. . . . . PURSLANE F. 69

Ovary 5-celled, with several ovules in each cell. . . . STERCULIA F. 75
Ovary 2-celled, with a pair of erect ovules in each cell. . . . VINE F. 85
Ovary 2–4-celled, with one erect ovule in each cell. . . . BUCKTHORN F. 86

Stamens when of the same number as the petals alternate with them, sometimes more numerous, sometimes fewer.
Leaves punctate with pellucid and dark dots, opposite, entire: calyx persistent. . . . ST. JOHN'S WORT F. 61
Leaves punctate with large pellucid dots: leaves alternate or compound. . . . RUE F. 81
Leaves not punctate with pellucid dots.
Ovary simple, as shown by the style, stigma, and single parietal placenta. . . . PULSE F. 94
Ovary seemingly simple, 1-celled, 1-seeded: style one. . . . Fumaria, FUMITORY F. 49
Ovary compound, as shown by the number of cells, placentæ, styles, or stigmas.
With 2 parietal placentæ, but 2-celled by a partition between: stamens tetradynamous. . . . MUSTARD F. 51
With 2 parietal placentæ and 1-celled: stamens 6, separate, not tetradynamous. . . . CAPER F. 56
With 2 parietal placentæ, and 1-celled: stamens 6 in 2 sets. . . . FUMITORY F. 49
With 3 (rarely 5) parietal placentæ, and 1-celled: stamens not 6.
Stamens inserted on the calyx, or with 5 clusters of gland-tipped stamen-like bodies. . . . SAXIFRAGE F. 131
Stamens on the long stalk of the ovary: tendril-climbers. . . . PASSION-FLOWER F. 157
Stamens on the receptacle.
Flower irregular: style 1. . . . VIOLET F. 58
Flower regular: styles various.
Styles or their divisions twice as many as the placentæ: leaves glandular-bristly. . . . SUNDEW F. 59
Styles as many as the placentæ: leaves awl-shaped or scale-shaped. . . . TAMARISK F. 63
Style and stigma one: stamens 5: leaves coriaceous. . . . PITTOSPORUM F. 57
Style and stigma one, or sessile stigmas 3: stamens not 5. . . . ROCK-ROSE F. 60
With one cell, one erect ovule, and 3 styles or stigmas. . . . CASHEW F. 84
With one cell and many ovules on a central placenta. . . . PINK F. 63
With two cells and several or many ovules in the centre, but becoming 1-celled.
Stamens 2 or 3 on the receptacle. . . . WATER-WORT F. 63
Stamens 4–12, on the calyx. . . . LOOSESTRIFE F. 149

II. MONOPETALOUS DIVISION OF EXOGENS.

A. *Calyx with its tube adherent to the ovary, i. e. superior, or ovary inferior.*

Flowers collected in a head which is provided with a calyx-like involucre: anthers syngenesious, i. e. united into a tube or ring around the style, only 4 or 5. . . . . COMPOSITE FAMILY, 179

Flowers not involucrate, or when in an involucrate head having the anthers separate.

Tendril-bearing herbs: leaves alternate: flowers monœcious or diœcious. . . . . GOURD F. 158

Not tendril-bearing: flowers commonly perfect, at most polygamous.

Stamens free from the corolla, or at most lightly cohering with its very base.

Flowers irregular: stamens with the 5 anthers and sometimes the filaments also united. . . . LOBELIA F. 208

Flowers regular: herbs, with some milky juice: stamens only as many as the lobes of the corolla. CAMPANULA F. 209

Flowers regular: shrubs, or evergreen and trailing: stamens twice as many as lobes of corolla. WHORTLEBERRY F. 211

Stamens borne on the tube of the corolla and fewer than its lobes, viz.

One to three: ovary sometimes 3-celled, but the fruit only 1-celled and 1-seeded. . . . . . . VALERIAN F. 177

Four, two of them shorter: ovary 3-celled, but two cells empty: fruit one-seeded. Linnæa, HONEYSUCKLE F. 169

Four, one longer and one shorter pair: ovary one-celled: fruit very many-seeded. . . . . . GESNERIA F. 228

Stamens borne on the corolla, twice or more than twice the number of its lobes, more or less monadelphous or 5-adelphous: leaves alternate. . . . . STORAX F. 220

Stamens borne on the tube of the corolla, just as many as its lobes: leaves opposite or whorled.

With stipules, entire. CINCHONA F. 173

Without stipules, entire, in whorls: ovary 2-celled: fruit twin, 2-seeded. . . . . MADDER F. 173

Without true stipules, often toothed or compound, chiefly opposite: flowers not in a proper head. HONEYSUCKLE F. 169

Without stipules, often toothed or cut: flowers in an involucrate head: ovary 1-celled, 1-seeded. . . TEASEL F. 178

B. *Calyx free from the ovary, i. e. inferior, or ovary superior.*

rolla more or less irregular.

Stamens 10 or 5, distinct : anthers opening by a hole at the apex of each cell : ovary 5-celled. . . . . HEATH FAMILY, 210

Stamens 10, diadelphous or monadelphous : anthers opening lengthwise : ovary 1-celled. . . . . . . PULSE F. 94

Stamens 8 or 6, diadelphous or monadelphous : anthers opening by a hole at the apex : ovary 2-celled. . . POLYGALA F. 92

Stamens 6, diadelphous : the middle anther of each set 2-celled, the other two 1-celled : ovary 1-celled. . . FUMITORY F. 49

Stamens (with anthers) 5.

- Ovary deeply 4-lobed, making 4 seed-like fruits or pieces. . . . . Echium, BORAGE F. 254
- Ovary not divided : fruit (mostly a pod) many-seeded.
  - Calyx urn-shaped, enclosing the pod, which is 2-celled, the top separating as a lid. Hyoscyamus, NIGHTSHADE F. 265
  - Calyx 5-cleft or 5-parted : pod 2-valved. . . . . Verbascum, &c., FIGWORT F. 229

Stamens (with anthers) 4 or 2.

- Ovary 1-celled with a central placenta, bearing several or many seeds : stamens 2. . . . . . BLADDERWORT F. 225
- Ovary 1-celled with 2 or 4 parietal placentæ : stamens 4, didynamous.
  - Leafless plants, brownish or yellowish, never green, with scales in place of foliage. . . . . BROOM-RAPE F. 228
  - Leafy plants, with ordinary foliage.
    - Not climbing : seeds minute, wingless. . . . . GESNERIA F. 228
    - Climbing : seeds winged. . . . . BIGNONIA F. 226
- Ovary 2-celled, many-ovuled : pod containing very many flat and winged seeds : woody climbers or trees. BIGNONIA F. 226
- Ovary 4-celled (but stigmas only 2) : many flat and wingless large seeds, filled by the embryo : herbs. . SESAMUM F. 227
- Ovary 2-celled, many-seeded or few-seeded, the placenta in the axis.
  - Seeds few or several in each cell, flat and borne on hook-like projections of the placentæ, or globular on a cartilaginous ring : no albumen. . . . . ACANTHUS F. 239
  - Seeds many or few in each cell, not borne on hooks, &c. : embryo in albumen. . . . . . . FIGWORT F. 229
- Ovary 2 – 4 celled, rarely 1-celled, with only a single ovule or seed in each cell, not lobed. . . . . VERVAIN F. 241
- Ovary 4-parted, making 4 seed-like pieces or nutlets around the single style. . . . . MINT F. 243

rolla regular.

Stamens more numerous than the divisions of the corolla. Here, from the cohesion of the bases of the petals, some of the following, ranked as polypetalous, may be sought.

Leaves twice pinnate, or else phyllodia: ovary one, simple, 1-celled. . . . . MIMOSA F. 99

Leaves simply compound, of 3 leaflets: ovary 5-celled: stamens 10, monadelphous at the base. Oxalis, GERANIUM F. 77

Leaves simple, in one compound, fleshy, very thick: *anthers 2-celled*: *pistils as many as lobes of the corolla.* ORPINE F. 137

Leaves simple or lobed or divided: stamens indefinite, monadelphous: anthers kidney-shaped, 1-celled. . MALLOW F. 70

Leaves simple, not lobed or divided, nor fleshy: anthers 2-celled: pistil compound, more than 1-celled.

Stamens on the receptacle, free or nearly free from the corolla: anthers commonly opening at the end. HEATH F. 210

Stamens on the corolla or mainly so: anthers opening lengthwise: trees or shrubs.

Flowers polygamous or diœcious: stamens separate: styles 4, each 2-lobed. . . . . . . EBONY F. 219

Flowers perfect: stamens more or less monadelphous or 5-clustered.

Base of the calyx coherent with base of the ovary. . . . . STORAX F. 220

Calyx wholly free from the ovary. . . . . CAMELLIA F. 75

Stamens (with anthers) as many as the lobes or divisions of the corolla and opposite them.

Styles or stigmas 5: ovary 1-celled: ovule and seed solitary. . . . . LEADWORT F. 222

Style and stigma only one.

Herbs: ovary 1-celled with a central placenta: seeds few or many. . . . . PRIMROSE F. 222

Trees or shrubs: ovary 5-celled: fruit 1–few-seeded: petal-like scales alternate with the anthers. SAPODILLA F. 220

Stamens (with anthers) as many as the lobes or parts of the corolla and alternate with them.

Pistil one and simple, with one parietal placenta: fruit a legume or loment: leaves twice pinnate. . . . MIMOSA F. 99

Pistils as many as the lobes of the corolla, separate: fleshy plants. . . . . ORPINE F. 137

Pistils several or many as to the ovary, or ovaries deeply lobed, the lobes or pieces making so many separate little 1-seeded fruits or akenes, but all around one common style.

Akenes or lobes numerous in a heap or several in a circle. . . . . NOLANA F. 266

Akenes or lobes only 4 around the base of the common style.

Aromatic plants, with opposite leaves. . . . . Mentha, &c., MINT F. 243

Not aromatic, with alternate and commonly rough leaves. . . . . BORAGE F. 254

Pistils 2 as to their ovaries, these making many-seeded pods, but stigmas and often styles also united into one.

Pollen powdery and loose, as in ordinary plants, not in masses. . . . . DOGBANE F. 274

Pollen all in waxy or granular masses, usually 10, and fixed in pairs to 5 glands of the stigma. . MILKWEED F. 276

Pistil one, with a single compound ovary which is not divided nor deeply lobed.

Stamens on the receptacle, or lightly cohering above with what seems to be the corolla: Mirabilis, FOUR-O'CLOCK F. 283

ovary 1-celled, 1-seeded. . . . . HEATH F. 210

Stamens on the receptacle, or nearly so: ovary 5-celled: pod many-seeded. . . . . . .

Stamens borne on very base of the 4 – 8-parted corolla: the cells of the ovary just as many, one ovule in each: HOLLY F. 218

no style: berry-like fruit containing as many little stones. . . . .

Stamens plainly borne on the corolla.

Leaves all radical, 1 – 7-ribbed: flowers in a spike: corolla thin and becoming dry: stamens 4: style and stigma one: pod 2-celled, rarely 3-celled, opening transversely. . . . . . . PLANTAIN F. 221

Leaves on the stem,

All opposite and entire, their bases or petioles connected by small stipules or a transverse stipular line: ovary and pod 2-celled, several-seeded. . . . . . . LOGANIA F. 273

All opposite or whorled and entire, without stipules: ovary and pod 1-celled, several – many-seeded: placentæ parietal. . . . . Allamanda, DOGBANE F. 274

Juice milky: leaves short-petioled. . . . .

Juice not milky, bitter: stem-leaves sessile. . . . . GENTIAN F. 270

Alternate or some opposite, without stipules: ovary and pod 1-celled with 2 parietal placentæ.

Smooth marsh or water-plants: leaves round-heart-shaped, entire, or of 3 entire leaflets. GENTIAN F. 270

More or less hairy plants: leaves mostly toothed or divided: style 2-cleft. . . WATERLEAF F. 258

Opposite, no stipules: ovary 4-celled, 4-ovuled: stamens 4: style not 3-cleft. . . . . VERVAIN F. 241

Opposite or alternate, simple or compound, without stipules, not twining: ovary and pod 3-celled: stamens 5: style 3-cleft at the apex. . . . .

Alternate, pinnate and tendril-bearing, lowest leaflets imitating leafy stipules. Cobæa, } POLEMONIUM F. 260

Alternate, at least not opposite, without stipules: stamens 5, rarely 4: ovary 2 – 5-celled.

Four cells of the ovary 1-ovuled: fruit splitting into little nutlets: flower-clusters coiled. HELIOTROPE F. 255

Pistils 3 or 4 : calyx as well as corolla none : flowers perfect, in a spike. . . . . . . LIZARD'S-TAIL F. 293
Pistils 1 – 4, enclosed by the persistent calyx : leaves alternate, pinnate or lobed, with stipules. . Poterium, &c., ROSE F. 115
Pistil only one, with 2 hairy styles or stigmas : leaves palmately compound or cleft : flowers diœcious. . . . HEMP F. 297
Pistil only one : leaves simple.
  Calyx corolla-like (white), its tube coherent with the ovary : flowers perfect : leaves alternate. . SANDALWOOD F. 292
  Calyx corolla-like, free from the ovary, but the base of its tube hardening and persistent as a covering to the thin akene, making a sort of nut-like fruit : style and stigma simple. . FOUR-O'CLOCK F. 283
  Calyx greenish, sometimes colored or corolla like : seed solitary.
    Style or stigma one and simple : flowers monœcious or diœcious. . . . . . . NETTLE FAMILY, 296
    Styles or stigmas 2 or 3, or 2 – 3-cleft : flowers mostly perfect.
      Flowers crowded with dry and scarious bracts. . . . . AMARANTH F. 286
      Flowers without imbricated and scarious bracts.
        Leaves chiefly alternate, often toothed, cleft, or lobed. . . . . . . GOOSEFOOT F. 284
        Leaves opposite, entire. . . . . CHICKWEED F. 64
  Calyx none, except as an adherent covering to the ovary, without lobes : aquatic. . . WATER-MILFOIL F. 140

Ovary 2 – 10-celled, with one or two ovules in each cell.
  Aquatic herbs, with 3 – 4-celled nut-like little fruits in the axils of the leaves or bracts. . . . . . WATER-MILFOIL F. 140
  Herbs, shrubs, rarely trees, with monœcious flowers, 3-celled ovary and 3-lobed pod : the ovules and seeds single or a pair hanging from the summit of the cell : juice milky, except in the Box, &c. . . . . . . SPURGE F. 293
  Herbs, *with stout hollow stems, perfect flowers*, and 10-celled ovary, becoming berry-like. . . . . . POKEWEED F. 284
  Shrubs or trees, with 2-celled ovary, and winged fruit (samara or key),
    Of two keys, joined at their base and winged from the apex. . . . . MAPLE F. 89
    Of a single key, winged from the apex or almost all round . leaves pinnate. . . . . . . Fraxinus, OLIVE F. 279
    Of a single key, thin-winged all round : leaves simple. . . . . ELM F. 296
  Shrubs *or trees with wingless 2 – 4-celled fruit, no milky juice, and*
    Perfect or sometimes diœcious flowers : stamens 4 or 5 : seeds erect. . . . . BUCKTHORN F. 86
    Perfect flowers : stamens about 24, white : seeds hanging. . . . . . . Fothergilla, WITCH-HAZEL F. 140

B. *Flowers (all monœcious or diœcious) one or both sorts in catkins or catkin-like heads.*

wining herb, with sterile flowers panicled, and fertile in a short scaly catkin (strobile). . . . . Humulus, NETTLE F. 296
arasitic shrub, on trees: fruit a berry. . . . . MISTLETOE F. 292
rees or shrubs,
With resinous juice, needle-shaped or scale-like leaves, and a cone (strobile) for fruit. . . . . PINE F. 309
With milky or colored juice, sterile flowers in spikes or racemes, and fertile in catkin-like heads or short spikes, forming a fleshy mass in fruit, enclosing the akenes. . . . . FIG F. 296
With colorless juice, often strong-scented resinous-aromatic bark, pinnate leaves, and only sterile flowers in catkins. WALNUT F. 300
With colorless juice and simple leaves.
Both kinds of flowers in short catkins or heads: fruit waxy-coated, berry-like or nut-like: leaves aromatic. SWEET-GALE F. 305
Both kinds of flowers in scaly catkins: the fertile with 2 or 3 flowers, forming winged or sometimes wingless akenes or small keys, under each scale or bract. . . . . BIRCH F. 306
Both kinds of flowers in catkins, diœcious, one under each scale or bract: pod filled with downy-tufted seeds. WILLOW F. 307
Both kinds of flowers in heads, monœcious, without calyx: leaves palmately-lobed.
Fruit of many two-beaked hard pods in a head: stipules deciduous. . . . . . . WITCH-HAZEL F. 140
Fruit a head of club-shaped hairy-based nutlets: stipules sheathing. . . . . PLANE-TREE F. 300
Both kinds of flowers or commonly only the sterile in catkins: fruit a nut in a scaly cup, or bur, or sac, or leafy-bracted involucre. . . . . OAK F. 301

GYMNOSPERMOUS EXOGENS.

With palm-like columnar trunks or corm-like stock, and pinnate palm-like foliage. . . . CYCADACEÆ or CYCAS F. 309
With branching trunks, and simple, mostly needle-shaped, linear, or scale-like entire leaves. . . . CONIFERÆ or PINE F. 309

III. GLUMACEOUS DIVISION OF ENDOGENS.

Ovary 3-celled or 1-celled with 3 parietal placentæ, becoming a pod, 3 – many-seeded: flowers with a regular perianth of six glumaceous divisions. In structure of the flower most like the Lily Family; but the glumaceous perianth and the herbage imitate this division. . . . . RUSH F. 349

Ovary 1-celled, 1-ovuled, in fruit an akene or grain. True glumaceous plants; the glumes being bracts.

Glumes single, bearing a flower in the axil. . . . . SEDGE F. 352

Glumes in pairs, an outer pair for the spikelet, an inner pair for each flower. . . . . GRASS F. 353

ACROGENOUS CRYPTOGAMOUS PLANTS.

With many-jointed stems and no leaves, except the united scales or teeth that form a sheath or ring at each joint: spore-cases in a terminal head or spike. . . . . HORSETAIL F. 359

With ample leaves often compound, all from a rootstock or trunk, and bearing the minute spore-cases. . . . . FERN F. 360

With scale-shaped, linear, or awl-shaped and wholly simple leaves thickly set on the leafy stems: spore-cases in the axil of some of them. . . . . CLUB-MOSS F. 372

KEY TO THOSE EXOGENS WHICH FROM THEIR FOLIAGE MIGHT PERHAPS BE MISTAKEN FOR ENDOGENS.

Pistils indefinitely numerous : herbs, polypetalous. . . . . Myosurus and some species of Ranunculus, CROWFOOT F. 33

Pistils 3 – 12, separate.

  Leaves peltate or round heart-shaped : aquatics, polypetalous. . . . . WATER-LILY F. 46

  Leaves heart-shaped : marsh-plants, apetalous, also destitute of calyx. . . . . . . LIZARD'S-TAIL F. 293

  Leaves thick and fleshy : polypetalous or some few monopetalous : flowers completely symmetrical. . . . ORPINE F. 137

Pistil one, but the ovary deeply 3 – 20-lobed or horned and styles separate : leaves thick and fleshy : polypetalous. FIG-MARIGOLD F. 156

Pistil one, the ovary 4-lobed, and sessile stigmas separate : leaves slender : aquatics. . . . . WATER-MILFOIL F. 140

Pistil one : ovary not lobed : polypetalous.

  Petals usually very numerous : ovary many-celled, many-seeded : aquatics. . . . . WATER-LILY F. 46

  Petals with the sepals usually very numerous : style 1 : ovary 1-celled, many-ovuled : fleshy, leafless plants. . CACTUS F. 152

  Petals and styles, also the stamens 5 : ovary 1-celled, one-ovuled. . . . . LEADWORT F. 222

  Petals 5 : styles 2 or 3 : ovary 1-celled, many-ovuled, free from the calyx : leaves opposite. . . Dianthus, &c., PINK F. 63

  Petals 5 : styles 2 : ovary 2-celled, 2-ovuled : teeth of the calyx on its summit : leaves alternate. Eryngium, &c., PARSELY F. 162

  Petals 5 or 4 : style only one, not lobed.

    Calyx free from the 1-celled simple ovary : stamens numerous. . . . . . . Acacias with phyllodia, MIMOSA F. 99

    Calyx adherent to the several-celled ovary : stamens 8 or 10. . . . . MELASTOMA F. 148

Pistil only one, both as to ovary and style : monopetalous.

  Stamens 5 : style 3-cleft at the apex : pod 3-celled. . . . . POLEMONIUM F. 260

  Stamens 4 : style and stigma one : corolla 4-cleft, dry and scarious : pod 2-celled : leaves ribbed. . . . PLANTAIN F. 221

  Stamens 8 or 10 : style and stigma one : corolla becoming dry and scarious : leaves narrow. . . . Heaths, HEATH F. 210

Pistil, if it may be so called, an open scale, or none. . . . . GYMNOSPERMS, 309

KEY TO THOSE ENDOGENS WHICH FROM THEIR FOLIAGE MIGHT BE MISTAKEN FOR EXOGENS.

Flowers spiked on a spadix, and with a prominent spathe. . . . . ARUM F. 317

Flowers not on a spadix: pistils several or many: calyx and corolla distinctly different. . . . WATER-PLANTAIN F. 319

Flowers not on a spadix: pistil only one.

  Calyx coherent with the ovary: flowers diœcious or polygamous.

    Terrestrial plants, twiners: small flowers *in racemes, spikes,* or *panicles*. . . . . YAM F. 335

    Aquatic plants: flowers from a spathe. . . . . FROG'S-BIT F. 321

  Calyx free from the ovary.

    Aquatic herbs: flowers more or less irregular, from a sort of spathe. . . . . . . PICKEREL-WEED F. 322

    Terrestrial herbs, not climbing: anthers 2-celled. . . . . Trillium, &c., LILY F. 337

    Terrestrial and mostly twining shrubs or herbs, with tendrils *on the petiole*: anthers one-celled. . . . SMILAX F. 336

SERIES I.

FLOWERING OR PHÆNOGAMOUS PLANTS:

THOSE which fructify by means of stamens and pistils, and produce true seeds.

CLASS I. DICOTYLÉDONOUS OR EXÓGENOUS PLANTS: Distinguished by having the wood or woody matter of the stem all in a circle between pith and bark, and in yearly layers when the stem is more than one year old: also the embryo with a pair of cotyledons or seed leaves (or several in Pines, &c.). Generally known at once by having netted-veined leaves. Parts of the flower seldom in threes, most commonly in fives or fours. See Lessons, p. 183. This class includes all our ordinary trees and shrubs, and the greater part of our herbs.

SUBCLASS I. ANGIOSPERMOUS: including all of the class which have their seeds in a pericarp, or their ovules in a closed ovary, i. e. all except the Pine and Cycas families.

I. POLYPETALOUS DIVISION. Includes the families which have, at least in some species, both calyx and corolla, the latter with their petals separate, i. e. not at all united into one body. Yet some plants of almost all these families have apetalous flowers.

1. RANUNCULACEÆ, CROWFOOT FAMILY.

Not perfectly distinguished by any one or two particular marks, but may be known, on the whole, by having an acrid watery juice (not milky or colored), numerous stamens, and usually more than one pistil, all the parts of the flower separate from each other, and inserted on the receptacle. The bulk of the seed is albumen, the embryo being very small. The plants are herbs, or a few barely shrubby. Many are cultivated for ornament. The following are the common genera, with their chief distinctions.

§ 1. *Sepals valvate or with their edges turned inward in the bud. Petals none or minute. Pistils many, 1-seeded, becoming akenes. Leaves opposite: the plants mostly climbing by their leaf-stalks.*

1. **CLEMATIS.** Sepals commonly 4, sometimes several, petal-like. Akenes tipped with the persistent style or a part of it.

§ 2. *Sepals imbricated in the bud. Not climbing, nor woody except in 8 and one of 20.*

* *Pistils and akenes several or many in a head, 1-seeded.*

+ *Petals none: sepals petal-like.*

2. HEPATICA. Involucre close to the flower, exactly imitating a 3-leaved calyx. Sepals 6 or more, oblong, resembling petals. Pistils 12–20. Stemless low perennials, with rounded 3-lobed leaves and 1-flowered scapes.
3. ANEMONE. Involucre of 2 or more opposite or whorled green leaves much below the flower. Sepals 4–20. Pistils very many in a close head (or fewer in one species), forming pointed or tailed akenes.
4. THALICTRUM. Involucre none, and stem-leaves all alternate, except in one species intermediate between this genus and Anemone. Sepals 4 or more. Pistils 4–15, forming several-angled or grooved akenes. Perennials, with small flowers in panicles or umbels, most of them diœcious, and with ternately compound or decompound leaves.

+ + *Petals and sepals both conspicuous, 5 or more. Akenes naked, short-pointed.*

5. ADONIS. Petals and sepals naked, no pit or appendage at the base. Akenes in a head or short spike.
6. MYOSURUS. Sepals with a spur at the base underneath. Petals on a slender claw, which is hollow at its apex. Akenes in a long tail-shaped spike.
7. RANUNCULUS. Sepals naked. Petals with a little pit or a scale on the short claw. Akenes in a head.

* * *Pistils several, 2-ovuled, becoming 1–2-seeded pods or berries.*

8. ZANTHORHIZA. Sepals 5, deciduous after flowering. Petals 5, small, 2-lobed, on a claw. Stamens 5–10. Little pods 1-seeded. Undershrub, with yellow wood and roots.
9. HYDRASTIS. Sepals 3, falling when the flower opens. Petals none. Fruit berry-like. Low perennial.

* * * *Pistils several, few, or one, forming several-seeded pods or rarely berries.*

+ *Sepals (4 or 5) falling when the flower opens, petal-like. Petals minute, and with claws, or none. Stamens numerous, white. Leaves ternately decompound.*

10. ACTÆA. Pistil only one, becoming a berry. Flowers in a short and thick raceme or cluster.
11. CIMICIFUGA. Pistils 1–8, becoming pods in fruit. Flowers in long racemes.

+ + *Sepals not falling when the flower opens, in 15 and 20 persistent even till the fruit matures, in all the others petal-like and deciduous.*

++ *Petals none at all: flowers regular.*

12. CALTHA. Sepals 5–9. Pods several. Leaves simple and undivided, rounded.

++ ++ *Petals 5 or more inconspicuous nectar-bearing bodies, very much smaller than the sepals: flower regular.*

13. TROLLIUS. Sepals 5–many. Petals with a little hollow near the base. Pods sessile. Leaves palmately parted and lobed.
14. COPTIS. Sepals 5–7. Petals club-shaped and tubular at the top. Pods raised on slender stalks! Leaves with 3 leaflets.
15. HELLEBORUS. Sepals 5, persistent, enlarging and turning green after flowering! Petals hollow and 2-lipped. Leaves palmately or pedately divided.
16. NIGELLA. Sepals 5. Petals 2-lobed. Pods 3–5 or more united below into one! Annuals, with finely dissected leaves.

++ ++ ++ *Petals large hollow spurs projecting between the sepals: flower regular.*

17. AQUILEGIA. Sepals 5. Pistils about 5, with slender styles, and forming narrow pods. Perennials, with ternately compound or decompound leaves.

++ ++ ++ ++ *Petals 2 or 4, much smaller than the 5 unequal sepals: i. e. the flower irregular and unsymmetrical. Leaves palmately lobed or parted. Pods 1–5.*

18. DELPHINIUM. Upper sepal spurred: the spur enclosing the spurs of the upper pair of petals: lower pair of petals spurless or wanting.
19. ACONITUM. Upper sepals in the form of a hood or helmet, covering the two very long-clawed and peculiar little petals.

++ ++ ++ ++ ++ *Petals large and flat, of ordinary shape. Sepals herbaceous and persistent! Flowers large, regular.*

20. PÆONIA. A fleshy disk surrounds the base of the 2 or more pistils, which form leathery pods in fruit. Seeds large, rather fleshy-coated. Perennials, with compound or decompound leaves: one species shrubby.

1. **CLÉMATIS**, VIRGIN'S-BOWER. (Ancient Greek name.) ♃ Ornamental climbers, the stalks of their leaves or leaflets clasping the support, and with somewhat woody stems, or a few are erect herbs.

§ 1. *Flowers (in spring) very large and widely open (3′–6′ across), with usually many small petals or petal-like altered stamens: leaflets in threes.*

C. flórida, GREAT-FL. C. Cult. from Japan, not hardy N.; the flower 3′–4′ across, its 6 or more sepals broad-ovate and overlapping each other, white, purplish, or with a purple centre of transformed stamens (var. SIEBOLDII); leaves often twice compound.

C. pàtens, (also called C. CŒRÙLEA, GRANDIFLÒRA, and various names for varieties.) Cult. from Japan, hardy. Flower 5′–7′ across, with 6–9 or more oblong or lance-shaped sepals, blue, purple, &c.; leaflets simply in threes.

C. verticillàris (or ATRÁGENE AMERICÀNA), with flowers about 3′ across, of 4 bluish-purple sepals, is rather scarce in rocky woods or ravines N. and in mountainous parts.

§ 2. *Flowers (in summer) pretty large, of only 4 sepals, and no petals whatever, not white, solitary on the naked peduncle as in § 1.*

* *Leaves (except the uppermost) pinnate or of 3 or more leaflets: climbers.*

C. Viticélla, VINE-BOWER C. Cult. from Eu.; a hardy climber, with flower 2′–3′ across; the widely spreading sepals obovate, thin, either purple or blue; akenes with short naked points.

C. gravèolens. HEAVY-SCENTED C. Cult. from Thibet, recently introduced, very hardy; with open yellow flowers 1½′ across, long and feathery tails to the akenes, and sharp-pointed leaflets.

C. Viórna, LEATHER-FLOWERED C. Wild from Penn. and Ohio S., in moist soil; flower of very thick leathery sepals, purple or purplish, 1′ long or more, erect, and with the narrow tips only spreading or recurved; akenes with very feathery tails.

* * *Leaves simple, entire, sessile: low erect herbs: tails feathery.*

C. integrifòlia, ENTIRE-LEAVED C. Cult. from Eu., sparingly. Stem simple; leaves oval or oblong; flower blue, 1′ long.

C. ochroleùca, PALE C. Wild from Staten Island S., but scarce, has ovate silky leaves and a dull silky flower.

§ 3. *Flowers (in summer) small, white, panicled, succeeded by feathery-tailed akenes.*

C. récta, UPRIGHT VIRGIN'S-BOWER. Cult. from Eu. Nearly erect herb, 3°–4° high, with large panicles of white flowers, in early summer; leaves pinnate; leaflets ovate or slightly heart-shaped, pointed, entire.

C. Flámmula, SWEET-SCENTED V. Cult. from Eu. Climbing freely, with copious sweet-scented flowers at midsummer; leaflets 3–5 or more, of various shapes, often lobed or cut.

C. Virginiàna, COMMON WILD V. Climbing high, with diœcious flowers late in summer; leaflets 3, cut-toothed or lobed.

2. **HEPÁTICA**, LIVER-LEAF, HEPATICA. (Shape of the 3-lobed leaves likened to that of the liver.) Among the earliest spring flowers. ♃ The involucre is so close to the flower and of such size and shape that it is most likely to be mistaken for a calyx, and the colored sepals for petals.

H. trìloba, ROUND-LOBED H. Leaves with 3 broad and rounded lobes, appearing later than the flowers, and lasting over the winter; stalks hairy; flowers blue, purple, or almost white. Woods, common E. Full double-flowered varieties, blue and purple, are cult. from Eu.

H. acutíloba, SHARP-LOBED H. Wild from Vermont W.; has pointed lobes to the leaves, sometimes 5 of them, and paler flowers.

3. **ANEMÒNE**, ANÉMONY, WIND-FLOWER. (Fancifully so named by the Greeks, because growing in windy places, or blossoming at the windy season, it is doubtful which.) ♃ Erect herbs, with all the stem-leaves above and opposite or whorled, forming the involucre or involucels. Peduncles 1-flowered.

§ 1. *Long hairy styles form feathery tails to the akenes, like those of Virgin's-Bower: fl. large, purple, in early spring. The genus* PULSATILLA *of some authors.*

A. Pulsatílla, PASQUE-FLOWER, of Europe. Cult. in some flower-gardens; has the root-leaves finely thrice-pinnately divided or cut; otherwise much like the next.

A. pàtens, var. **Nuttalliàna,** WILD P. On the plains N. W.; the handsome purple or purplish flower (2' or more across when open) rising from the ground on a low soft-hairy stem (3'-6' high), with an involucre of many very narrow divisions; the leaves from the root appearing later, and twice or thrice-ternately divided and cut.

§ 2. *Short styles not making long tails, but only naked or hairy tips.*

* *Garden* ANEMONIES, *from S. Eu., with tuberous roots and very large flowers.*

A. coronària, with leaves cut into many fine lobes, and 6 or more broad oval sepals, also

A. horténsis, with leaves less cut into broader wedge-shaped divisions and lobes, and many longer and narrow sepals, — are the originals of the showy, mostly double or semi-double, great-flowered GARDEN ANEMONIES, of all colors, red in the wild state, — not fully hardy, treated like bulbs.

* * *Wild species, smaller-flowered.*

+ *Pistils very many, forming a dense woolly head in fruit; leaves of the involucre long-petioled, compound: flowers of 5 small greenish-white sepals, silky beneath: stem 2°-3° high.*

A. cylíndrica, LONG-FRUITED A. Involucre several-leaved surrounding several long naked peduncles; fl. late in spring (in dry soil N. & W.), followed by a cylindrical head of fruit.

A. Virginiàna, VIRGINIAN A. Involucre 3-leaved; peduncles formed in succession all summer, the middle or first one naked, the others bearing 2 leaves (involucel) at the middle, from which proceed two more peduncles, and so on: head of fruit oval or oblong. Common in woods and meadows.

+ + *Pistils fewer, not woolly in fruit: flower 1' or more broad.*

A. Pennsylvánica, PENNSYLVANIAN A. Stem 1° high, bearing an involucre of 3 wedge-shaped 3-cleft and cut sessile leaves, and a naked peduncle, then 2 or 3 peduncles with a pair of smaller leaves at their middle, and so on; fl. white, in summer. (Lessons, fig. 179.) Alluvial ground, N. & W.

A. nemoròsa, WOOD A. Stem 4'-10' high, bearing an involucre of 3 long-petioled leaves of 3 or 5 leaflets, and a single short-peduncled flower; sepals white, or purple outside. Woodlands, early spring.

4. THALÍCTRUM, MEADOW-RUE. (Old name, of obscure derivation.) The following are the common wild species, in woodlands and low grounds.

§ 1. *Flowers perfect, few, in an umbel: resembling an Anemone: sepals 5-10.*

T. anemonoìdes, RUE-ANEMONE. A very smooth and delicate little plant, growing with Wood Anemone, which it resembles in having no stem-leaves except those that form an involucre around the umbel of white (rarely pinkish) flowers, appearing in early spring; leaflets roundish, 3-lobed at the end, long-stalked; ovaries many-grooved, and with a flat-topped sessile stigma: otherwise it would rank as an Anemone.

§ 2. *Flowers mostly diœcious and not handsome, small, in loose compound panicles; the 4 or 5 sepals falling early: stigmas slender: akenes several-grooved and angled: leaves ternately decompound* (Lessons, fig. 138), *all alternate; the uppermost not forming an involucre.*

T. dioìcum, EARLY MEADOW-RUE. Herb glaucous, 1°-2° high; flowers greenish, in early spring; the yellowish linear anthers of the sterile plant hanging on long capillary filaments: leaves all on general petioles. Rocky woods.

T. purpuráscens, PURPLISH M. Later, often a little downy, 2°-4°

high; stem-leaves not raised on a general petiole; flowers greenish and purplish; anthers short-linear, drooping on capillary and upwardly rather thickened filaments.

T. Cornùti, Tall M. Herb 4°–8° high; stem-leaves not raised on a general petiole; flowers white, in summer; anthers oblong, not drooping; the white filaments thickened upwards. Low or wet ground.

5. ADÒNIS. (The red-flowered species fabled to spring from the blood of Adonis, killed by a wild boar.) Stems leafy; leaves finely much cut into very narrow divisions. Cult. from Europe for ornament.

A. autumnàlis, Pheasant's-eye A. ① Stems near 1° high, it or the branches terminated by a small flower, of 5–8 scarlet or crimson petals, commonly dark at their base. Has run wild in Tennessee.

A. vernàlis, Spring A. ♃ Stems about 6′ high, bearing a large showy flower, of 10–20 lanceolate light-yellow petals, in early spring.

6. MYOSÙRUS, Mousetail (which the name means in Greek). ①

M. minimus. An insignificant little plant, wild or run wild along streams from Illinois S., with a tuft of narrow entire root-leaves, and scapes 1′–3′ high, bearing an obscure yellow flower, followed by tail-like spike of fruit of 1′–2′ long, in spring and summer.

7. RANÚNCULUS, Crowfoot, Buttercup. (Latin name for a little frog, and for the Water Crowfoots, living with the frogs.) A large genus of wild plants, except the double-flowered varieties of three species cult. in gardens for ornament. (Lessons, p. 183, fig. 358–361.)

§ 1. *Aquatic; the leaves all or mostly under water, and repeatedly dissected into many capillary divisions: flowering all summer.*

R. aquátilis, White Water-Crowfoot. Capillary leaves collapsing into a tuft when drawn out of the water; petals small, white, or only yellow at the base, where they bear a spot or little pit, but no scale; akenes wrinkled crosswise.

R. divaricàtus, Stiff W. Like the last, but less common; the leaves stiff and rigid enough to keep their shape (spreading in a circular outline) when drawn out of water.

R. multífidus, Yellow W. Leaves under water much as those of the White Water Crowfoots, or rather larger; but the bright yellow petals as large as those of Common Buttercups, and, like them, with a little scale at the base. (Formerly named R. Purshii, &c.)

§ 2. *Terrestrial, many in wet places, but naturally growing with the foliage out of water: petals with the little scale at the base, yellow in all the wild species.*

* *Akenes not prickly nor bristly nor striate on the sides.* ♃

+ Spearwort Crowfoots; *growing in very wet places, with mostly entire and narrow leaves: fl. all summer.*

R. alismæfòlius. Stems ascending, 1°–2° high; leaves lanceolate or the lowest oblong; flower fully ½′ in diameter; akenes beaked with a straight and slender style.

R. Flámmula. Smaller than the last, and akenes short-pointed; rare, but very common along borders of ponds and rivers is the

Var. **rèptans,** or Creeping S., with slender stems creeping a few inches in length; leaves linear or spatulate, seldom 1′ long; flower only ¼′ broad.

+ + Small-flowered Crowfoots; *in wet or moist places, with upper leaves 3-parted or divided, and very small flowers, the petals shorter or not longer than the calyx: fl. spring and summer.*

R. abortivus, Small-flowered C. Very smooth and slender, 6′–2° high; root-leaves rounded, crenate; akenes in a globular head. Shady places, along watercourses.

R. scelerátus, Cursed C. So called because the juice is very acrid and blistering; stouter than the last and thicker-leaved, equally smooth, even the

16. NIGÉLLA, FENNEL-FLOWER. (Name from the black seeds.) ① Garden plants from Eu. and Orient; with leafy stems, the leaves finely divided, like Fennel; known by having the 5 ovaries united below into one 5-styled pod. Seeds large, blackish, spicy; have been used as a substitute for spice or pepper.

N. Damascèna, COMMON F. or RAGGED-LADY. Flower bluish, rather large, surrounded and overtopped by a finely-divided leafy involucre, like the other leaves; succeeded by a smooth inflated 5-celled pod, in which the lining of the cells separates from the outer part.

N. satìva, NUTMEG-FLOWER. Cult. in some old gardens; has coarser leaves, and smaller rough pods.

17. AQUILÈGIA, COLUMBINE. (From *aquila*, an eagle, the spurs of the petals fancied to resemble talons.) ♃ Well-known, large-flowered ornamental plants: flowers in spring and early summer, usually nodding, so that the spurs ascend.

* *North American species, with long straight spurs to the corolla.*

A. Canadénsis, WILD C. Flowers about 2′ long, scarlet and orange, or light yellow inside, the petals with a very short lip or blade, and stamens projecting. Common on rocks.

A. Skínneri, MEXICAN C., is taller, later, and considerably larger-flowered than the last, the narrower acute sepals usually tinged greenish; otherwise very similar. Cult.

A. cærùlea, LONG-SPURRED C., native of the Rocky Mountains, lately introduced to gardens, and worthy of special attention; has blue and white flowers, the ovate sepals often 1½′, the very slender spurs 2′ long, the blade of the petals (white) half the length of the (mostly blue) sepals, spreading.

* * *Old World species, with hooked or incurved spurs to the corolla.*

A. vulgàris, COMMON GARDEN C. Cult. in all gardens, 1° – 3° high, many-flowered; spurs rather longer than the blade or rest of the petal; pods pubescent. Flowers varying from blue to purple, white, &c., greatly changed by culture, often full double, with spur within spur, sometimes all changed into a rosette of plane petals or sepals.

A. glandulòsa, GLANDULAR C. A more choice species, 6′ – 1° high, with fewer very showy deep blue flowers, the blade of the petals white or white-tipped and twice the length of the short spurs; pods and summit of the plant glandular-pubescent.

A. Sibírica, SIBERIAN C. Equally choice with the last, and like it; but the spurs longer than the mostly white-tipped short blade, as well as the pods, &c. smooth.

18. DELPHÍNIUM, LARKSPUR. (From the Latin name of the dolphin, alluding to the shape of the flower.) The familiar and well-marked flower of this genus is illustrated in Lessons, p. 91, 94, fig. 183, 184, 192.

* *Garden annuals from Eu., with only the 2 upper petals, united into one body, one pistil, and leaves finely and much divided: fl. summer and fall.*

D. Consólida, FIELD L. Escaped sparingly into roadsides and fields; flowers scattered on the spreading branches, blue, varying to pink or white; pod smooth.

D. Ajàcis, ROCKET L. More showy, in gardens, and with similar flowers crowded in a long close raceme, and downy pods; spur shorter: some marks on the front of the united petals were fancied to read AIAI = Ajax.

* * *Perennials, with 4 separate petals and 2 – 5, mostly 3 pistils.*

D. grandiflòrum, GREAT-FL. L. of the gardens, from Siberia and China, is 1° – 2° high, with leaves cut into narrower linear divisions; blue flowers, 1½′ or more across, with ample oval sepals, and the 2 lower petals rounded and entire. Various in color, also double-flowered; summer.

D. cheilánthum, of which D. FORMOSUM, SHOWY L., is one of the various garden forms, also Siberian, is commonly still larger-flowered, deep

blue, with lower petals also entire or nearly so; the mostly downy leaves have fewer and lanceolate or wedge-lanceolate divisions; is now much mixed and crossed with others: summer.

D. azùreum, Azure L. Wild S. & W., often downy, 1° – 3° high, with narrow linear divisions to the leaves, and a spike-like raceme of rather small, azure, pale-blue, or sometimes white flowers, in spring; sepals and 2-cleft lower petals oblong. Var. with full-double flowers in gardens: summer.

D. tricórne, Dwarf Wild L. Open woods from Penn. W. & S.: about 1° high from a branched tuberous root; has broader linear lobes to the leaves, and a loose raceme of few or several rather large showy flowers, deep blue or sometimes white, in spring; sepals and cleft lower petals oblong; pods strongly diverging.

D. exaltàtum, Tall Wild L., is the wild species (from Penn. W. & S.) most resembling the next, 3° – 5° high, but the less handsome flowers and panicled racemes hoary or downy: fl. summer.

D. elàtum, Bee Larkspur. Cult. from Eu.: 3° – 6° high, with broad leaves 5 – 7-cleft beyond the middle, and the divisions cut into sharp lobes or teeth; many flowers (in summer) in a long wand-like raceme, blue or purplish; the 2-cleft lower petals prominently yellowish-bearded in the common garden form. There are many varieties and mixtures with other species, some double-flowered.

19. ACONÌTUM, ACONITE, WOLFSBANE, MONKSHOOD. (Ancient name.) ♃ Root thick, tuberous or turnip-shaped, a virulent poison and medicine. Leaves palmately divided or cleft and cut-lobed. Flowers showy: the large upper sepal from its shape is called the *casque* or *helmet*. Under it are two long-stalked queer little bodies which answer for petals. See Lessons, p. 92, fig. 185, 186, 193. The following are all cult. from Eu. for ornament, except the first: fl. summer.

A. uncinàtum, Wild A. or Monkshood. Stem slender, 3° – 5°. erect, but bending over above, as if inclined to climb; leaves cleft or parted into 3 – 5 ovate or wedge-lanceolate cut-toothed lobes; flowers loosely panicled, blue; the roundish helmet nearly as broad as high, its pointed visor turned down. Low grounds, from Penn. S. & W.

A. variegàtum, Variegated A. Erect; leaves divided to the base into rather broad-lobed and cut divisions; flowers in a loose panicle or raceme, blue and often variegated with white or whitish; the helmet considerably higher than wide, its top curved forward, its pointed visor ascending or horizontal.

A. Napéllus, True Monkshood or Officinal Aconite. Erect, from a turnip-shaped root; leaves divided to the base and then 2 – 3 times cleft into linear lobes; flowers crowded in a close raceme, blue (also a white variety); helmet broad and low.

A. Ánthora, a low species, with very finely divided leaves, and crowded yellow flowers, the broad helmet rather high, occurs in some old gardens.

20. PÆÒNIA, PÆONY. (Ancient name, after a Greek physician, *Pæon.*) ♃ Well-known large-flowered ornamental plants, cult. from the Old World. Leaves ternately decompound. Roots thickened below.

* *Herbs, with single-flowered stems, in spring, and downy pods.*

P. officinàlis, Common P. Very smooth, and with large coarsely divided green leaves; the great flowers red, white, &c., single or very double.

P. peregrina, of Eu., in the gardens called P. paradóxa, has leaves glaucous and more or less downy beneath, and smaller flowers than the last, rose-red, &c., generally full double, and petals cut and fringed.

P. tenuifòlia, Slender-leaved P. of Siberia, is low, with early crimson-red flowers, and narrow linear divisions to the leaves.

* * *Herbs, with several-flowered stems, in summer, and smooth pods.*

P. albiflòra, White-fl. or Fragrant P., or Chinese P. Very smooth about 3° high, with bright green foliage, and white or rose-colored, often sweet-scented, rather small flowers, single, also double, and with purple varieties.

* * * *Shrubby: fl. in spring and early summer.*

P. Moùtan, TREE PÆONY, of China. Stems $2^{\circ}-3^{\circ}$ high; leaves pale and glaucous, ample; flowers very large (6′ or more across), white with purple base, or rose-color, single or double; the disk, which in other species is a mere ring, in this forms a thin-fleshy sac or covering, enclosing the 5 or more ovaries, but bursting, and falling away as the pods grow.

2. MAGNOLIACEÆ, MAGNOLIA FAMILY.

Trees or shrubs, with aromatic bitter bark, simple mostly entire alternate leaves, and solitary flowers; the sepals and petals on the receptacle and usually in threes, but together occupying more than two ranks, and imbricated in the bud; pistils and mostly the stamens numerous, the latter with adnate anthers (Lessons, p. 113, fig. 233); and seeds only 1 or 2 in each carpel; the embryo small in albumen.

I. Stipules to the leaves forming the bud-scales, and falling early. Flowers perfect, large. Stamens and pistils many on a long receptacle or axis, the carpels imbricated over each other and cohering into a mass, forming a sort of cone in fruit. These are the characters of the true Magnolia Family, of which we have two genera.

1. LIRIODENDRON. Sepals 3, reflexed. Corolla bell-shaped, of 6 broad greenish-orange petals. Stamens almost equalling the petals, with slender filaments, and long anthers opening outwards. Carpels thin and scale-form, closely packed over each other, dry in fruit, and after ripening separating and falling away from the slender axis; the wing-like portion answering to style; the small seed-bearing cell at the base and indehiscent. Leaf-buds flat: stipules free from the petiole.
2. MAGNOLIA. Sepals 3. Petals 6 or 9. Stamens short, with hardly any filaments: anthers opening inwards. Carpels becoming fleshy in fruit and forming a red or rose-colored cone, each when ripe (in autumn) splitting down the back and discharging 1 or 2 coral-red berry-like seeds, which hang on extensile cobwebby threads. Stipules united with the base of the petiole, falling as the leaves unfold.

II. Stipules none. Here are two Southern plants which have been made the representatives of as many small orders.

3. ILLICIUM. Flowers perfect. Petals 9–30. Stamens many, separate. Pistils several in one row, forming a ring of almost woody little pods.
4. SCHIZANDRA. Flowers monœcious. Petals mostly 6. Stamens 5, united into a disk or button-shaped body, which bears 10 anthers on the edges of the 5 lobes. Pistils many in a head, which lengthens into a spike of scattered red berries.

1. LIRIODÉNDRON, TULIP-TREE (which is the meaning of the botanical name in Greek). Only one species,

L. Tulipífera. A tall, very handsome tree, in rich soil, commonest W., where it, or the light and soft lumber (much used in cabinet-work), is called WHITE-WOOD, and even POPLAR; planted for ornament; fl. late in spring, yellow with greenish and orange. Leaves with 2 short side-lobes, and the end as if cut off.

2. MAGNÒLIA. (Named for the botanist *Magnol.*) Some species are called UMBRELLA-TREES, from the way the leaves are placed on the end of the shoots; others, CUCUMBER-TREES, from the appearance of the young fruit.

* *Native trees of this country, often planted for ornament.*

M. grandiflòra, GREAT-FLOWERED MAGNOLIA of S., half-hardy in the Middle States. The only perfectly evergreen species; splendid tree with

coriaceous oblong or obovate leaves, shining above, mostly rusty beneath; the flowers very fragrant, white, very much larger than the next, in spring.

M. glaùca, Small M. or Sweet Bay. Wild in swamps N. to New Jersey and Mass.; a shrub or small tree, with the oblong obtuse leaves white or glaucous beneath, and globular white and fragrant flowers (2′–3′ wide), in summer. The leaves are thickish and almost evergreen, quite so far south.

M. acuminàta, Cucumber M. or Cucumber-tree. Wild from N. Y. W. & S.; a stately tree, with the leaves thin, green, oblong, acute or pointed at both ends, and somewhat downy beneath, and pale yellowish-green flowers (3′ broad), late in spring.

M. cordàta, Yellow Cucumber M., of Georgia, hardy even in New England; *like the last, but a small tree with the leaves ovate or oval, seldom* cordate; and the flowers lemon-yellow.

M. macrophýlla, Great-leaved M., of Carolina, nearly hardy N. to Mass. A small tree, with leaves very large (2°–3° long), obovate-oblong with a cordate base, downy and white beneath, and an immense open-bellshaped white flower (8′–12′ wide when outspread), somewhat fragrant, in early summer; petals ovate, with a purple spot at the base.

M. Umbrélla, Umbrella M. (also called M. tripétala). Wild in Penn. and southward. A low tree, with the leaves on the end of the flowering branches crowded in an umbrella-like circle, smooth and green both sides, obovate-lanceolate, pointed at both ends, 1°–2° long, surrounding a large white flower, in spring; the petals 2½′–3′ long, obovate-lanceolate and acute, narrowed at the base; the ovate-oblong cone of fruit showy in autumn, rose-red, 4′–5′ long.

M. Fràseri, Ear-leaved Umbrella M. (also called M. auriculàta). Wild from Virginia S., hardy as the last, and like it; but a taller tree, with the leaves seldom 1° long and auricled on each side at the base, the white obovate-spatulate petals more narrowed below into a claw; cone of fruit smaller.

* * *Chinese and Japanese species.*

M. conspícua, Yulan of the Chinese, half-hardy in N. States. A small tree, with very large white flowers appearing before any of the leaves, which are obovate, pointed, and downy when young.

M. Soulangeàna is a hybrid of this with the next, more hardy and the petals tinged with purple.

M. purpùrea, Purple M. of Japan, hardy N. A shrub, the showy flowers (pink-purple outside, white within) beginning to appear before the leaves, which are obovate or oval, and bright dark green.

3. **ILLÍÇIUM,** STAR-ANISE. (From a Latin word, meaning *to entice.*) Shrubs, aromatic, especially the bark and pods, with evergreen oblong leaves.

I. anisàtum, of China, which yields an *oil of anise,* has small yellowish flowers, is rare in greenhouses.

I. Floridànum, Wild Anise-tree, of Florida, &c.; has larger dark purple flowers, of 20–30 narrow petals, in spring.

4. **SCHIZÁNDRA.** (Name from two Greek words, means *cut-stamens.*)

S. coccínea, *a twining shrub of* S. States, *scarcely at all aromatic,* with thin ovate or oblong leaves, and small crimson-purple flowers, in spring.

3. ANONACEÆ, CUSTARD-APPLE FAMILY.

Trees or shrubs, with 3 sepals and 6 petals in two sets, each set valvate in the bud, and many short stamens on the receptacle, surrounding several pistils, which ripen into pulpy fruit containing large and flat bony seeds. Embryo small; the albumen which forms the bulk of the kernel appears as if cut up into small pieces. Foliage and properties resembling Magnolia Family, but seldom aromatic, and no stipules. All tropical, except the single genus

5. JEFFERSÒNIA, TWIN-LEAF. (Named for *Thomas Jefferson.*)

J. diphýlla, sometimes called RHEUMATISM-ROOT. Wild in rich woods, W. & S., sometimes cult.; the pretty white flower and the leaves both long-stalked, from the ground, appearing in early spring.

6. PODOPHÝLLUM, MAY-APPLE, or MANDRAKE. (Name means *foot-leaf*, the 5 – 7-parted leaf likened to a webbed-foot.)

P. peltàtum. Wild in rich soil: the long running rootstocks (which are poisonous and medicinal) send up in spring some stout stalks terminated by a large, 7 – 9-lobed, regular, umbrella-shaped leaf (i. e. peltate in the middle), and some which bear two one-sided leaves (peltate near their inner edge), with a large white flower nodding in the fork. The sweet pulpy fruit as large as a pullet's egg, ripe in summer: rarely 2 or more to one flower.

6. NYMPHÆACEÆ, WATER-LILY FAMILY.

Aquatic perennial herbs, with the leaves which float on the surface of the water or rise above it mostly peltate or roundish-heart-shaped, their margins inrolled in the bud, long-petioled; axillary 1-flowered peduncles; sepals and petals hardly ever 5, the latter usually numerous and imbricated in many rows. The genera differ so widely in their botanical characters that they must be described separately. One of them is the famous Amazon Water-Lily, VICTORIA REGIA, with floating leaves 3 feet or more in diameter, and the magnificent flowers almost in proportion; while the dull flowers of Water-shield are only half an inch long.

1. BRASENIA. Sepals and petals each 3 or 4, narrow, and much alike, dull purple. Stamens 12 – 18: filaments slender. Pistils 4 – 18, forming indehiscent 1 – 3-seeded pods. All the parts separate and persistent. Ovules commonly on the dorsal suture! Embryo, &c. as in Water-Lily.
2. NELUMBIUM. Sepals and petals many and passing gradually into each other, deciduous. Stamens very many, on the receptacle, the upper part of which is enlarged into a top-shaped body, bearing a dozen or more ovaries, each tipped with a flat stigma and separately immersed in as many hollows. (Lessons, p. 126, fig. 284.) In fruit these form 1-seeded nuts, resembling small acorns. The whole kernel of the seed is embryo, a pair of fleshy and farinaceous cotyledons enclosing a plumule of 2 or 3 rudimentary green leaves.
3. NYMPHÆA. Sepals 4, green outside. Petals numerous, many times 4, passing somewhat gradually into the numerous stamens (Lessons, p. 99, fig. 198): both organs grow attached to the globular many-celled ovary, the former to its sides which they cover, the latter borne on its depressed summit. Around a little knob at the top of the ovary the numerous stigmas radiate as in a poppy-head, ending in long and narrow incurved lobes. Fruit like the ovary enlarged, still covered by the decaying persistent bases of the petals: numerous seeds cover the partitions. Ripe seeds each in an arillus or bag open at the top. (Lessons, p. 135, fig. 318.) Embryo, like that of Nelumbium on a very small scale, but enclosed in a bag, and at the end of the kernel, the rest of which is mealy albumen.
4. NUPHAR. Sepals usually 6 or 5, partly green outside. Petals many small and thickish bodies inserted under the ovary along with the very numerous short stamens. Ovary naked, truncate at the top, which is many-rayed by stigmas, fleshy in fruit: the internal structure as in Nymphæa, only there is no arillus to the seeds.

1. BRASÈNIA, WATER-SHIELD. (Name unexplained.) One species,

B. peltàta. In still, rather deep water: stems rising to the surface, slender, coated with clear jelly, bearing floating oval centrally-peltate leaves (2′ – 3′ long), and purplish small flowers, produced all summer.

2. NELÚMBIUM, NELUMBO. (Ceylonese name.) Rootstocks interrupted and tuberous, sending up, usually out of water, very long petioles and

peduncles, bearing very large (1° – 2° wide) and more or less dish-shaped or cup-shaped centrally-peltate entire leaves, and great flowers (5′ – 10′ broad), *in summer. Seeds, also the tubers, eatable.*

N. lùteum, Yellow N. or Water Chinquepin. Common W. & S.: introduced, by Indians perhaps, at Sodus Bay, N. Y., Lyme, Conn., and below Philadelphia. Flower pale dull yellow: anther hook-tipped.

N. speciòsum, Showy N., Lotus or Sacred Bean of India, with pinkish flowers and blunter anthers: cult. in choice conservatories.

3. NYMPHÆA, WATER-LILY, POND-LILY. (Dedicated to the Water-Nymphs.) Long prostrate rootstocks, often as thick as one's arm, send up floating leaves (rounded and with a narrow cleft nearly or quite to the petiole) and large handsome flowers, produced all summer: these close in the afternoon: the fruit ripens under water.

N. odoràta, Sweet-scented White W. Common in still or slow water, especially E. Flower richly sweet-scented, white, or sometimes pinkish, rarely pink-red, variable in size, as are the leaves; seeds oblong.

N. tuberòsa, Tuber-bearing W. Common through the Great Lakes, and W. & S. Flower nearly scentless (its faint odor like that of apples), pure white, usually larger (4′ – 9′ in diameter), as are also the leaves (8′ – 15′ wide); petals broader and blunter; seeds almost globular; rootstock bearing copious tubers like "artichokes," attached by a narrow neck and spontaneously separating.

N. cærùlea, Blue W., of Egypt, &c., cult. in aquaria; a tender species, with crenate-toothed leaves, and blue or bluish sweet-scented flowers, the petals fewer and acute.

4. NÙPHAR, YELLOW POND-LILY, or SPATTER-DOCK. (Old Greek name.) *Rootstock, &c. as in Nymphæa: leaves often rising out of water: flowers by no means showy, yellow, sometimes purplish-tinged, produced all summer*: fruit ripening above water.

N. àdvena is the common species, everywhere; has 6 unequal sepals or *sometimes more; petals, or what answer to them, truncate, shorter than the* stamens and resembling them; the thickish leaves rounded or ovate-oblong.

N. lùteum, rare N.; has smaller flowers, with 5 sepals, petals dilated upwards and more conspicuous, and a globular fruit with a narrow neck: the var. **pùmilum,** a small variety, has flowers only 1′, and leaves 1′ – 5′ in diameter; rather common N.

N. sagittifòlia, Arrow-leaved N., from North Carolina S.; has sagittate leaves, (1° by 2′), *and 6 sepals. This and the last produce their earlier* leaves under water and very thin.

7. SARRACENIACEÆ, PITCHER-PLANT FAMILY.

Consists of one South American plant, of the curious Darlingtonia Californica in the mountains of California, and of the following: —

1. SARRACÈNIA. (Named for *Dr. Sarrasin* of Quebec.) Sidesaddle-Flower, a most unmeaning popular name. Leaves all radical from a perennial root, and in the form of hollow tubes or pitchers, winged down the inner side, open at the top, where there is a sort of arching blade or hood. The whole foliage yellowish green or purplish. Scape tall, naked, bearing a single large nodding flower, in early summer. Sepals 5, with 3 bractlets at the base, colored, persistent. Petals 5, fiddle-shaped, incurved over the peltate and umbrella-shaped 5-angled petal-like great top to the style. Stamens very numerous. Ovary 5-celled. Pod many-seeded, rough-warty.

S. purpùrea, Purple S. or Pitcher-Plant of the North, where it is common in bogs. Leaves pitcher-shaped, open, with an erect round-heart-shaped hood and a broad side-wing, purple-veiny; flower deep purple.

S. rùbra, Red-flowered Trumpet-Leaf of S. States: sometimes cult. in greenhouses. Leaves trumpet-shaped, slender, a foot long, with a narrow wing and an erect ovate pointed hood; flower crimson-purple.

S. Drummóndii, Great Trumpet-Leaf of Florida: sometimes cult. Leaves much like the last, but 2° or 3° long, upper part of the tube and the roundish erect hood variegated and purple-veiny; and the deep-purple flower very large.

S. psittacina, Parrot Pitcher-Plant of S. States, and rarely cult. Leaves short and spreading, with a narrow tube, a broad wing, and an inflated globular hood, which is incurved over the mouth of the tube, spotted with white; flower purple.

S. variolàris, Spotted Trumpet-Leaf of S. States. Leaves erect, trumpet-shaped, white-spotted above, longer than the scape, with a broad wing, and an ovate hood arching over the orifice; flower yellow.

S. flàva, Yellow Trumpet-Leaf of S. States: cult. more commonly than the rest, as a curiosity, and almost hardy N. Leaves trumpet-shaped, 2° long, erect, yellowish or purple-veiny, with a narrow wing, and an erect roundish but pointed hood, a tall scape, and yellow flower.

8. PAPAVERACEÆ, POPPY FAMILY.

Herbs with milky or colored juice, regular flowers, a calyx mostly of 2 sepals which fall when the blossom opens, petals twice or 3 – 5 times as many, numerous stamens on the receptacle, and a compound 1-celled ovary, with 2 or more parietal placentæ. Fruit a pod, many-seeded. Juice narcotic, as in Poppy (opium), or acrid. No. 5 has watery juice, with the odor of muriatic acid, and the calyx like a cap or lid; No. 7 has no petals and few seeds.

* *Petals crumpled in the flower-bud, which droops on its peduncle before opening.*

1. PAPAVER. Stigmas united into a many-rayed circular body which is closely sessile on the ovary. Pod globular or oblong, imperfectly many-celled by the projecting placentæ which are covered with numberless seeds, opening only by pores or chinks at the top. Juice white.
2. STYLOPHORUM. Stigma 3 - 4-lobed, raised on a style. Pod ovoid, bristly, opening from the top into 3 or 4 valves, leaving the thread-like placentæ between them. Juice yellow.
3. CHELIDONIUM. Stigma 2-lobed, almost sessile. Pod linear, with 2 placentæ, splitting from below into 2 valves. Juice orange.

* * *Petals more or less crumpled in the bud, which is erect before opening.*

4. ARGEMONE. Stigma 3 - 6-lobed, almost sessile. Sepals and oblong pod prickly; the latter opening by valves from the top, leaving the thread-like placentæ between. Juice yellow.
5. ESCHSCHOLTZIA. Sepals united into a pointed cap which falls off entire. Receptacle or end of the flower-stalk dilated into a top-shaped body, often with a spreading rim. Stigmas 4 – 6, spreading, unequal; but the placentæ only 2. Pod long and slender, grooved. Juice colorless.

* * * *Petals not crumpled in the bud, which does not droop.*

6. SANGUINARIA. Sepals 2: but the petals 8 – 12. Stigma 2-lobed, on a short style. Pod oblong, with 2 placentæ. Juice orange-red.

* * * * *Petals none. Flowers in panicles, drooping in the bud.*

7. BOCCONIA. Sepals 2, colored. Stigma 2-lobed. Pod few-seeded. Juice reddish.

1. PAPÀVER, POPPY. (Ancient name.) We have no truly wild species: the following are from the Old World.

* *Annuals, flowering in summer: cult. and weeds of cultivation.*

P. somníferum, Opium Poppy. Cult. for ornament, especially double-flowered varieties, and for medical uses. Smooth, glaucous, with clasping and wavy leaves, and white or purple flowers.

P. Rhœas, Corn Poppy of Eu. Low, bristly, with almost pinnate leaves, and deep red or scarlet flowers with a dark eye, or, when double, of various colors; pod obovate.

P. dùbium, Long-headed P. Leaves with their divisions more cut than the last; flowers smaller and lighter red, and pod oblong-clavate: run wild in fields in Penn.

* * *Perennial: cult. for ornament: flowering in late spring.*

P. orientàle, Oriental P. Rough-hairy, with tall flower-stalks, almost pinnate leaves, and a very large deep-red flower, under which are usually some leafy persistent bracts. Var. bracteàtum, has these bracts larger, petals still larger and deeper red, with a dark spot at the base.

2. STYLÓPHORUM, CELANDINE POPPY. (Name means *style-bearer*, expressing a difference between it and Poppy and Celandine.) ♃

S. diphýllum. From Penn. W. in open woods; resembling Celandine, but low, and with far larger (yellow) flowers, in spring.

3. CHELIDÒNIUM, CELANDINE. (From the Greek word for the *Swallow*.) ② ♃

C. màjus, the only species, in all gardens and moist waste places; 1°–4° high, branching, with pinnate or twice pinnatifid leaves, and small yellow flowers in a sort of umbel, all summer; the pods long and slender.

4. ARGEMÒNE, PRICKLY POPPY. (Meaning of name uncertain.) ①

A. Mexicàna, Mexican P. Waste places and gardens. Prickly, 1°–2° high; leaves sinuate-lobed, blotched with white; flowers yellow or yellowish, pretty large, in summer. Var. albiflòra has the flower larger, sometimes very large, white; cult. for ornament.

5. ESCHSCHÓLTZIA. (Named for one of the discoverers, *Eschscholtz*, the name easier pronounced than written.) ①

E. Califórnica, Californian annual, now common in gardens; with pale dissected leaves, and long-peduncled large flowers, remarkable for the top-shaped dilatation at the base of the flower, on which the extinguisher-shaped calyx rests: this is forced off whole by the opening petals. The latter are bright orange-yellow, and the top of the receptacle is broad-rimmed. Var. Douglásii wants this rim, and its petals are pure yellow, or sometimes white; but the sorts are much mixed in the gardens; and there are smaller varieties under different names.

6. SANGUINÀRIA, BLOOD-ROOT. (Name from the color of the juice.) ♃

S. Canadénsis, the common and only species; wild in rich woods, handsome in cultivation. The thick red rootstock in early spring sends up a rounded-reniform and palmate-lobed veiny leaf, wrapped around a flower-bud: as the leaf comes out of ground and opens, the scape lengthens, and carries up the handsome, white, many-petalled flower.

7. BOCCÒNIA. (Named in honor of an Italian botanist, *Bocconi*.) ♃

B. cordàta, Cordate B., from China, the only hardy species; a strong root sending up very tall leafy stems, with round-cordate lobed leaves, which are veiny and glaucous, and large panicles of small white or pale rose-colored flowers, late in summer.

9. FUMARIACEÆ, FUMITORY FAMILY.

Like the Poppy Family in the plan of the flowers; but the 4-petalled corolla much larger than the 2 scale-like sepals, also irregular and closed, the two inner and smaller petals united by their

spoon-shaped tips, which enclose the anthers of the 6 stamens in two sets, along with the stigma: the middle anther of each set is 2-celled, the lateral ones 1-celled. Delicate or tender and very smooth herbs, with colorless and inert juice, and much dissected or compound leaves.

* *Corolla heart-shaped or 2-spurred at base: pod several-seeded.*

1. DICENTRA. Petals slightly cohering with each other. Seeds crested.
2. ADLUMIA. Petals all permanently united into one slightly heart-shaped body, which encloses the small pod. Seeds crestless. Climbing by the very compound leaves.

* * *Corolla with only one petal spurred at base.*

3. CORYDALIS. Ovary and pod slender, several-seeded. Seeds crested.
4. FUMARIA. Ovary and small closed fruit globular, 1-seeded.

1. DICÉNTRA (meaning two-spurred in Greek). Commonly but wrongly named DICLÝTRA or DIÉLYTRA. ♃ Fl. in spring.

* *Wild species, low, with delicate decompound leaves and few-flowered scapes sent up from the ground in early spring.*

D. Cucullària, DUTCHMAN'S BREECHES. Common in leaf-mould in woods N. Foliage and flowers from a sort of granular-scaly bulb; corolla white tipped with yellow, with the two diverging spurs at the base longer than the pedicel.

D. Canadénsis, CANADIAN D. or SQUIRREL-CORN. With the last N. Separate yellow grains, like Indian corn, in place of a scaly bulb; the corolla narrower and merely heart-shaped at base, white or delicately flesh-colored, sweet-scented; inner petals much crested at tip.

D. exímia is rarer, wild along the Alleghanies, occasionally cult., has coarser foliage, and more numerous flowers than the last, pink-purple, and produced throughout the summer, from tufted scaly rootstocks.

* * *Cultivated exotic, taller and coarser, leafy-stemmed, many-flowered.*

D. spectábilis, SHOWY D. or BLEEDING HEART. From N. China, very ornamental through spring and early summer, with ample Peony-like leaves, and long drooping racemes of bright pink-red heart-shaped flowers (1′ long): the two small sepals fall off in the bud.

2. ADLÚMIA, CLIMBING FUMITORY. (Named in honor of a *Mr. Adlum.*) ② The only species is

A. cirrhòsa. Wild in low shady grounds from New York W. & S. and cult.; climbing over bushes or low trees, by means of its 2–3-pinnately compound delicate leaves, the stalks of the leaflets acting like tendrils; flowers flesh-colored, panicled, all summer.

3. CORÝDALIS. (Greek name for Fumitory.) Our species are leafy-stemmed, ① or ②, wild in rocky places, fl. spring and summer.

C. glaùca, PALE CORYDALIS. Common, 6′–3° high, very glaucous, with the whitish flowers variegated with yellow and pink, a short and rounded spur, and erect pods.

C. flàvula, YELLOWISH C. From Penn. S. & W.: has the flowers pale yellow, with the tips of the outer petals wing-crested; seeds sharp-edged: otherwise like the next.

C. aùrea, GOLDEN C. From Vermont W. & S. Low and spreading; flowers golden-yellow with a longish spur, and crestless tips, hanging pods, and smooth blunt-edged seeds.

4. FUMÀRIA, FUMITORY. (Name from *fumus*, smoke.) ① Low, leafy-stemmed, with finely cut compound leaves.

F. officinàlis, COMMON F. Common in old gardens, waste places, and dung-heaps; a delicate small weed, with a close spike of small pinkish crimson-tipped flowers in summer.

10. CRUCIFERÆ, MUSTARD FAMILY.

Herbs, with watery juice, of a pungent taste (as exemplified in Horseradish, Mustard, Water-Cress, &c.), at once distinguished by the cruciferous flower (of 4 sepals, 4 petals, their upper part generally spreading above the calyx in the form of a cross), the tetradynamous stamens (i. e. 6, two of them shorter than the other four); and the single 2-celled pistil with two parietal placentæ, forming the kind of pod called a silique, or when short a silicle. (See Lessons, p. 92, fig. 187, 188, for the flower, and p. 133, fig. 310, for the fruit.) The embryo fills the whole seed, and has the radicle bent up against the cotyledons. Flowers in racemes, which are at first short, like simple corymbs, but lengthen in fruiting: no bracts below the pedicels. The blossoms are all nearly alike throughout the family; so that the genera are mainly known by the fruit and seed, which are usually to be had before all the flowers have passed.

§ 1. *Fruit a true pod, opening lengthwise by two valves, which fall away and leave the thin persistent partition when ripe.*

* *Seeds or ovules more than two in each cell.*

+ *Pod beaked or pointed beyond the summit of the valves, or the style with a conical base. Seeds spherical, the cotyledons wrapped around the radicle.*

1. BRASSICA. Flowers yellow. Pods oblong or linear.

+ + *Pod not beaked or conspicuously pointed,*

++ *Neither flattened nor 4-sided, but the cross-section nearly circular.*

2. SISYMBRIUM. Pods in the common species shortish, lance-awl-shaped, close-pressed to the stem. Seeds oval, marginless. Flowers small, yellowish.
3. NASTURTIUM. Pods shortish or short (from oblong-linear to almost spherical). Seeds in 2 rows in each cell, globular, marginless. Flowers yellow or white.
4. HESPERIS. Pods long and slender, with a single row of marginless seeds in each cell (as broad as the partition); the radicle laid against the back of one of the cotyledons. Flowers rather large, pink-purple. Stigma of 2 erect blunt lobes.
5. MALCOLMIA. Pods somewhat thickened at the base. Stigma of 2 pointed lobes. Otherwise as No. 4.
6. MATTHIOLA. Pods long and narrow: seeds one-rowed in each cell (as broad as the partition), flat, wing-margined; the radicle laid against one edge of the broad cotyledons. Flowers pink-purple, reddish, or varying to white, large and showy.

++ ++ *Pod long and slender, linear, 4-sided (the cross section square or rhombic), or if flattened having a strong salient midrib to the valves. Seeds marginless, mostly single-rowed in each cell. Flowers yellow or orange, never white.*

a. *Lateral sepals sac-shaped at the base.*

7. CHEIRANTHUS. Seeds flat; the radicle laid against the edge of the broad cotyledons. Flowers showy. Leaves entire.

b. *Sepals nearly equal and alike at the base.*

8. ERYSIMUM. Seeds oblong; the radicle laid against the back of one of the narrow cotyledons. Leaves simple.
9. BARBAREA. Seeds oval; the radicle laid against the edge of the broad cotyledons. Leaves lyrate or pinnatifid.
2. SISYMBRIUM. Seeds oblong; the radicle laid against the back of one of the cotyledons. Flowers small. Leaves twice pinnatifid.

++ ++ ++ *Pod flattened parallel to the partition; the valves flat or flattish: so are the seeds: radicle against the edge of the cotyledons. Flowers white or purple.*

10. ARABIS. Pod long and narrow-linear, not opening elastically; the valves with a midrib. Seeds often winged or margined.
11. CARDAMINE. Pods linear or lanceolate; the valves with no or hardly any midrib, opening elastically from the base upwards. Seeds marginless and slender-stalked, one-rowed in each cell. No scaly-toothed rootstock.

12. DENTARIA. Pods, &c. as in the preceding. Seed-stalks broad and flat. Stem 2-3-leaved in the middle, naked below, springing from a horizontal scaly-toothed or irregular fleshy rootstock.
13. LUNÀRIA. Pods oval or oblong, large and very flat, stalked above the calyx. Seeds winged, 2-rowed in each cell. Flowers pretty large, purple.
14. DRABA. Pods round-oval, oblong or linear, flat. Seeds wingless, 2-rowed in each cell. Flowers small, white in the common species.

↔ ↔ ↔ ↔ *Pod short, flattish parallel to the broad partition. Flowers yellow, small.*

15. CAMELINA. Pods turgid, obovate or pear-shaped.

↔ ↔ ↔ ↔ ↔ *Pod short, very much flattened contrary to the narrow partition; the valves therefore deeply boat-shaped. Flowers white, small.*

16. CAPSELLA. Pods obovate-triangular, or triangular with a notch at the top.

* * *Seeds or the ovules single or sometimes 2 in each cell. Pods short and flat.*

← *Corolla irregular, the petals being very unequal.*

17. IBERIS. Flowers in short and flat-topped clusters, white or purple; the two petals on the outer side of the flower much larger than the others. Pods scale-shaped, roundish or ovate, much flattened contrary to the very narrow partition, notched at the wing-margined top.

← ← *Corolla regular, small.*

18. LEPIDIUM. Pods scale-shaped, much flattened contrary to the very narrow partition, often notched or wing-margined at the top. Flowers white.
19. ALYSSUM. Pods roundish, flattened parallel to the broad partition. Seeds flat, commonly wing-margined. Flowers yellow or white.

§ 2. *Fruit indehiscent, wing-like, 1-seeded.*

20. ISATIS. Flowers yellow. Fruit 1-celled, 1-seeded, resembling a small samara or ash-fruit.

§ 3. *Fruit fleshy, or when ripe and dry corky, not opening by valves, 2-many-seeded.*

21. CAKILE. Fruit jointed in the middle; the two short joints 1-celled, 1-seeded. Seed oblong.
22. RAPHANUS. Fruit several-seeded, with cellular matter or with constrictions between the spherical seeds.

1. BRÁSSICA, CABBAGE, MUSTARD, &c. (Ancient Latin name of Cabbage. Botanically the Mustards rank in the same genus.) ① ② Cult. from Eu., or run wild as weeds; known by their yellow flowers, beak-pointed pods, and globose seeds, the cotyledons wrapped round the radicle.

B. oleràcea, CABBAGE. The original is a sea-coast plant of Europe, with thick and hard stem, and pretty large pale yellow flowers; the leaves very glabrous and glaucous; upper ones entire, clasping the stem, not auricled at the base: cult. as a biennial, the rounded, thick, and fleshy, strongly veined leaves collect into a head the first year upon the summit of a short and stout stem. — Var. BROCCOLI is a state in which the stem divides into short fleshy branches, bearing clusters of abortive flower-buds. — Var. CAULIFLOWER has the nourishing matter mainly concentrated in short imperfect flower-branches, collected into a flat head. — Var. KOHLRABI has the nourishing matter accumulated in the stem, which forms a turnip-like enlargement above ground, beneath the cluster of leaves. — KALE is more nearly the natural state of the species, the fleshy leaves not forming a head.

B. campéstris, of the Old World; like the last, but with brighter flowers; the lower leaves pinnatifid or divided and rough with stiff hairs, and the upper auricled at the base, is represented in cultivation by the Var. COLZA or RAPE, with small annual root, cult. for the oil of the seed. — Var. TURNIP (B. NAPUS); cult. as a biennial, for the nourishment accumulated in the napiform white root. — Var. RUTABAGA or SWEDISH TURNIP, has a longer and yellowish root.

B. Sinipástrum, or **Sinàpis arvénsis,** CHARLOCK. A troublesome weed of cultivation in grainfields, annual, with the somewhat rough leaves barely toothed or little lobed, and nearly smooth pods spreading in a loose raceme, the seed-bearing part longer than the conical (usually empty) beak.

B. (or **Sinàpis**) **alba,** WHITE MUSTARD. Cult. and in waste places, annual; the leaves all pinnatifid and rough-hairy; pods spreading in the raceme,

bristly, the lower and turgid few-seeded portion shorter than the 1-seeded stout and flattened beak; seeds large, pale brown.

B. (*or* **Sinàpis**) **nigra,** Black Mustard. Cult. and in waste places; leaves less hairy and less divided than the last; pods erect in the raceme or spike, smooth, short, 4-sided (the valves having a strong midrib), and tipped with the short empty conical base of a slender style; seeds dark brown, smaller, and more pungent than in the last.

2. SISÝMBRIUM, HEDGE MUSTARD. (The ancient Greek name.)

S. officinàle, Common H. ① Coarse weed in waste places, with branching stems, runcinate leaves, and very small pale yellow flowers, followed by awl-shaped obscurely 6-sided pods close pressed to the axis of the narrow spike.

S. canéscens, Hoary H. or Tansy-Mustard. ① Commonly only S. & W., hoary, with finely cut twice-pinnatifid leaves, minute yellowish flowers, and oblong-club-shaped 4-sided pods on slender horizontal pedicels.

3. NASTÚRTIUM, WATER-CRESS, HORSERADISH, &c. (Name from *nasus tortus,* convulsed nose, from the pungent qualities.) Here are combined a variety of plants, widely different in appearance: the following are the commonest.

* *Nat. from Eu.: the white petals twice the length of the calyx.* ♃

N. officinàle, Water-Cress. Planted or run wild in streamlets, spreading and rooting, smooth, with pinnate leaves of 3 – 11 roundish or oblong leaflets; fl. all summer; pods broadly linear, slightly curved upwards on their spreading pedicels. Young plants eaten.

N. Armoràcia, Horseradish. Planted or run wild in moist soil; with very large oblong or lanceolate leaves, chiefly from the ground, crenate, rarely cut or pinnatifid; pods globular, but seldom seen. The long deep root is a familiar condiment.

* * *Indigenous species, in wet places: petals yellow or yellowish.*

N. palústre, Marsh-Cress. A very common homely weed, erect, 1° – 3° high, with pinnatifid or lyrate leaves of several oblong cut-toothed leaflets, small yellowish flowers, and small oblong or ovoid pods.

N. sessiliflòrum, like the last, but with less lobed leaves, very minute sessile flowers, and longer oblong pods, is common from Illinois S. And there are 2 or 3 more in some parts, especially S.

4. HÉSPERIS, ROCKET. (Greek for *evening,* the flowers being then fragrant.) ♃

H. matronàlis, Common or Dame R. Tall and rather coarse plant in country gardens, from Eu., inclined to run wild in rich shady soil; with oblong or lanceolate toothed leaves, and rather large purple flowers, in summer, followed by (2′ – 4′) long and slender pods.

5. MALCÒLMIA. (Named for *W. Malcolm,* an English gardener.)

M. marítima, Mahon Stock, called Virginia Stock in England, but comes from the shores of the Mediterranean: a garden annual, not much cult., a span high, with pale green oblong or spatulate nearly entire leaves, and pretty pink-red flowers changing to violet-purple, also a white var. (much smaller than those of true Stock); pods long and slender.

6. MATTHÌOLA, STOCK or GILLIFLOWER. (Named for the early naturalist, *Matthioli.*) Cult. garden or house plants, from Eu., hoary-leaved, much prized for their handsome and fragrant, pretty large, pink, reddish, or white flowers, of which there are very double and showy varieties.

M. incàna, Common Stock. ♃ Stout stem becoming almost woody: not hardy at the N.

M. ánnua, Ten-week Stock. ① Probably only an herbaceous variety of the last; flowers usually not double.

7. CHEIRANTHUS, WALLFOWER. (*Cheiri* is the Arabic name.) Like Stocks, but slightly if at all hoary, and the flowers orange, brown-reddish, or yellow. ♃

C. Cheiri, Common Wallflower. Cult. from S. Eu., not hardy N., a much-prized house-plant; stem woody, crowded with the narrow and pointed entire leaves.

8. ERYSIMUM. (Name from Greek, and meaning to draw blisters, from the acridity.)

E. ásperum, Western Wallflower. Wild from Ohio W. & S.; like the wild state of the Wallflower, with bright yellow or orange flowers, but the seeds are different, and the long pods quite square in the cross-section; the leaves somewhat toothed and hoary. ② ♃

E. cheiranthoides, Treacle-Mustard or Wormseed Mustard. A rather insignificant annual, wild or run wild in waste moist places, with slender branches, lanceolate almost entire leaves, and small yellow flowers, followed by shortish and obscurely 4-sided pods on slender spreading pedicels.

9. BARBARÈA, WINTER-CRESS. (The Herb of Santa Barbara.) Different from the last genus in the seeds, divided leaves, and in the general aspect. Leaves used by some as winter salad, but bitterish. ② ♃

B. vulgàris, Common W. or Yellow Rocket. Smooth, common in old gardens and other rich soil, with green lyrate leaves, and bright yellow flowers, in spring and summer; pods erect, crowded in a dense raceme, much thicker than their pedicels.

B. præcox, Early W. or Scurvy-Grass. Cult. from Penn. S. for early salad, beginning to run wild, probably a variety of the last, with more numerous and narrower divisions to the leaves; the less erect pods scarcely thicker than their pedicels.

10. ÁRABIS, ROCK-CRESS. (Name from Arabic.) Fl. spring and summer. Leaves mostly simple and undivided.

* *Wild species, on rocks, &c.: flowers white or whitish, not showy.* ②

A. lyràta, Low R. A delicate, low, nearly smooth plant, with a cluster of lyrate root-leaves; stem-leaves few and narrow; bright white petals rather conspicuous; pods slender, spreading.

A. hirsùta, Hairy R. Strictly erect, 1° – 2° high; stem-leaves many and sagittate; small greenish-white flowers and narrow pods erect.

A. lævigàta, Smooth R. Erect, 1° – 2° high, glaucous; upper leaves sagittate; flowers rather small; pods 3′ long, very narrow and not very flat, recurving; seeds winged.

A. Canadénsis, Canadian or Sicklepod R. Tall, growing in ravines; stem-leaves pointed at both ends, pubescent; petals whitish, narrow; pods 3′ long, scythe-shaped, very flat, hanging; seeds broadly winged.

* * *Wild, on river banks: flowers pink-purple, rather showy.* ② ♃

A. hesperidoides, Rocket R. Smooth, erect, 1° – 3° high; with rounded or heart-shaped long-petioled root-leaves, ovate-lanceolate stem-leaves (2′ – 6′ long), the lower on a winged petiole or with a pair of small lateral lobes; petals long-clawed; pods spreading, narrow; seeds wingless. Banks of the Ohio and S. W.

* * * *Garden species: flowers white, showy.* ♃

A. alpina, Alpine R., and its variety? A. Albida, from Eu., low and tufted, hairy or soft-downy, are cult. in gardens; fl. in early spring.

11. CARDAMÌNE, BITTER-CRESS. (Ancient Greek name.) ♃

C. hirsùta, Small B. A low and branching insignificant herb, usually not hairy, with slender fibrous root, pinnate leaves, the leaflets angled or toothed, and small white flowers, followed by narrow upright pods: common in moist soil, fl. spring and summer.

C. praténsis, Cuckoo-Flower or Ladies' Smock. Stem ascending from a short perennial rootstock; the pinnate leaves with rounded and stalked entire small leaflets; flowers in spring, showy, pink or white: in bogs at the north, and a double-flowered variety is an old-fashioned plant in gardens.

C. rhomboidea. Stems upright from a small tuber, simple, bearing rather large white or rose-purple flowers in spring, and simple angled or sparingly toothed leaves, the lowest rounded or heart-shaped, the upper ovate or oblong: in wet places northward.

12. DENTÀRIA, TOOTHWORT. (From the Latin *dens*, a tooth.) ♃

D. diphýlla, Two-leaved T., Pepper-root, or Crinkle-root. So called from the fleshy, long and toothed rootstocks, which are eaten and taste like Water-Cress; there are only 2 stem leaves, close together, each of 3 rhombic-ovate and toothed leaflets, and the root-leaf is similar; flowers quite large, white, in spring. Woods in vegetable mould, N.

D. laciniàta, Laciniate T. Rootstock necklace-form or constricted in 2 or 3 places, scarcely toothed; stem-leaves 3 in a whorl, each 3-parted into linear or lanceolate leaflets, which are cut or cleft into narrow teeth, or the lateral ones 2-lobed; flowers purplish, in spring: banks of streams.

13. LUNÀRIA, HONESTY or SATIN-FLOWER. (Name from *Luna*, the moon, from the shape of the broad or rounded pods.) ② ♃

L. biénnis, Common Honesty. Not native to the country, but cultivated in old-fashioned places, for the singular large oval pods, of which the broad white partitions, of satiny lustre, remaining after the valves have fallen, are used for ornament; leaves somewhat heart-shaped; flowers large, pink-purple, in early summer.

L. rediviva, Perennial Honesty, is a much rarer sort, with oblong pods; seldom met with here.

14. DRÀBA, WHITLOW-GRASS. (Name is a Greek word, meaning acrid.) Low herbs, mostly with white flowers: the commoner species are the following: fl. early spring; winter annuals.

D. Caroliniàna. Leaves obovate, hairy, on a very short stem, bearing a short raceme or corymb on a scape-like peduncle 1′ – 4′ high; petals not notched; pods broadly linear, much larger than their pedicels: in sandy waste places.

D. vérna. A diminutive plant, with a tuft of oblong or lanceolate root-leaves, and a scape 1′ – 3′ high; petals 2-cleft; pods oval or oblong, in a raceme, shorter than their pedicels: in sandy waste places.

15. CAMÈLINA, FALSE-FLAX. (An old name, meaning *dwarf-flax*; the common species was fancied to be a degenerate flax.) ②

C. sativa, Common F. A weed, in grain and flax-fields, 1° – 2° high, with lanceolate leaves, the upper ones sagittate and clasping the stem; small pale-yellow flowers, followed by obovate turgid pods in a long loose raceme; style conspicuous.

16. CAPSÉLLA, SHEPHERD'S-PURSE. (Name means *a little pod.*) ①

C. Bursa-Pastòris, Common S. The commonest of weeds, in waste places; root-leaves pinnatifid or toothed, those of the stem sagittate and partly clasping; small white flowers followed by the triangular and notched pods, in a long raceme.

17. IBÈRIS, CANDYTUFT. (Name from the country, *Iberia*, an old name for Spain.) Low garden plants, from Europe, cultivated for ornament; different from the rest of the order in the irregular corollas.

I. umbellàta, Common C. ②. Lower leaves lanceolate, the upper linear and entire; flowers purple-lilac (or pale), in flat clusters, in summer.

I. sempérvirens, Evergreen C. ♃ Rather woody-stemmed, tufted, with bright green lanceolate or linear-spatulate thickish entire leaves, and flat clusters of pure white flowers, in spring.

18. LEPÍDIUM, PEPPERGRASS. (A Greek word, meaning *little scale*, from the pods.) Our common species have incised or pinnatifid leaves, and very small white or whitish flowers. ①

L. Virgínicum, Wild P. A common weed by roadsides, with petals, and usually only 2 stamens; the little pods orbicular and scarcely margined at the notched top; seeds flat, the radicle against the edge of the cotyledons.

L. ruderàle, introduced from Europe, is much less common, more branched, with no petals, smaller scarcely notched pods, and turgid seeds, the radicle against the back of one of the cotyledons.

L. satìvum, Garden P. Cult. as a cress, has petals, and the larger ovate pods are winged and slightly notched at the top.

19. ALÝSSUM, MADWORT. (Name refers to being a fancied remedy for canine madness.) Cult. for ornament; from Eu.

A. marítimum, Sweet Alyssum. A spreading little plant, from Europe, fl. all summer in gardens, or in the greenhouse in winter, green or slightly hoary, with lanceolate or linear entire leaves tapering at the base, and small white honey-scented flowers, in at length elongated racemes, the round little pods with a single seed in each cell. A variety much used for borders has paler and white-edged leaves.

A. saxátile, Rock A. Low, hoary-leaved, with abundant bright yellow flowers, in spring; cult. from Europe. ♃

20. ÌSATIS, WOAD. (Name of obscure derivation.) ② One common species of Eu.,

I. tinctòria, Dyer's Woad. Rather tall, glabrous and glaucous, with the stem-leaves lanceolate and entire, sessile and somewhat sagittate; the racemes of small yellow flowers panicled, succeeded by the hanging samara-like closed pods; fl. in early summer. Old gardens, formerly cult. for a blue dye.

21. CAKÌLE, SEA-ROCKET. (An old Arabic name.) ① ②

C. Americàna, American S. A fleshy herb, wild on the shore of the sea and Great Lakes, with obovate wavy-toothed leaves, and purplish flowers.

22. RÁPHANUS, RADISH. (Ancient Greek name, said to refer to the rapid germination of the seeds.) ① ② All from the Old World.

R. satìvus, Radish. Cult. from Eu.; with lyrate lower leaves, purple and whitish flowers, and thick and pointed closed pods; the seeds separated by irregular fleshy false partitions: cult. for the tender and fleshy pungent root: inclined to run wild.

R. caudàtus, Rat-tail R., from India, lately introduced into gardens, rather as a curiosity, is a probable variety of the Radish, with the narrow pod a foot or so long, eaten when green.

R. Raphanístrum, Wild R. or Jointed Charlock. Troublesome weed in cult. fields, with rough lyrate leaves, yellow petals changing to whitish or purplish, and narrow long-beaked pods, which are divided across between the several seeds, so as to become necklace-form.

11. CAPPARIDACEÆ, CAPER FAMILY.

In our region these are herbs, resembling *Cruciferæ*, but with stamens not tetradynamous and often more than 6, no partition in the pod (which is therefore 1-celled with two parietal placentæ), and kidney-shaped seeds, the embryo rolled up instead of folded together: the leaves commonly palmately compound, and the herbage bitter and nauseous instead of pungent. But in warm regions the Cress-like pungency sometimes appears, as in *capers*, the pickled flower-buds of Cápparis spinosa, of the Levant. This and its near relatives are trees or shrubs.

1. CLEOME. Calyx 4-cleft. Petals 4. Stamens 6, on a short thickened receptacle. Ovary and many-seeded pod in ours raised above the receptacle on a long stalk. Style very short or none. Usually an appendage on one side of the receptacle.
2. GYNANDROPSIS. Sepals 4. Stamens borne on the long stalk of the ovary far above the petals. Otherwise as in No. 1.
3. POLANISIA. Sepals 4. Stamens 8 – 32. Ovary and pod sessile or short-stalked on the receptacle. Style present. Otherwise nearly as No. 1.

1. CLEÒME. (From a Greek word meaning *closed*, the application not obvious.) ①

C. púngens. Tall (2° – 4° high), clammy-pubescent, with little spines or prickly points (whence the name) in place of stipules, about 7 broadly lanceolate leaflets, but the bracts simple and ovate or heart-shaped, and a raceme of large and handsome flowers, with long-clawed pink or purple petals and declined stamens. Cult. from S. America, for ornament, and run wild S.

C. integrifòlia, much smaller, very smooth, with 3 leaflets and the pink petals without claws, is wild in Nebraska, &c., and lately introduced to gardens.

2. GYNANDRÓPSIS. (Greek-made name, meaning that the stamens appear to be on the pistil.) (Lessons, p. 125, fig. 276.)

G. pentaphýlla. Nat. from Carolina S. from West Indies, is a clammy-pubescent weed, with 5 leaflets to the leaves and 3 to the bracts; the white petals on claws.

3. POLANÍSIA. (Greek-made name, meaning *many-unequal*, referring to the stamens.)

P. gravèolens. A heavy-scented (as the name denotes), rather clammy, low herb, with 3 oblong leaflets, and small flowers with short white petals, about 11 scarcely longer purplish stamens, and a short style; fl. summer. Wild on gravelly shores, from Conn. W.

12. RESEDACEÆ, MIGNONETTE FAMILY.

Herbs, with inconspicuous flowers in spikes or racemes; represented by the main genus,

1. RESÈDA, MIGNONETTE, &c. (From a Latin word, *to assuage*, from supposed medical properties.) Calyx 4 – 7-parted, never closed even in the bud. Petals 4 – 7, unequal, cleft or notched, those of one side of the flower appendaged within. Stamens 10 – 40, borne on a sort of disk dilated on one side of the flower. Ovary and pod composed of 3 – 6 carpels united not quite to the top into a 3 – 6-lobed or 3 – 6-horned 1-celled pistil which opens at the top long before the seeds are ripe. The seeds are numerous, kidney-shaped, on 3 – 6 parietal placentæ. Leaves alternate.

R. odoràta, COMMON MIGNONETTE. Cult. (from N. Africa) as an annual, for the delicious scent of the greenish-white flowers; the anthers orange; petals 6, the posterior ones cut into several fine lobes; stems low; some leaves entire and oblong, others 3-lobed.

R. Lutèola, DYER'S M. or WELD. Nat. along roadsides, tall, with lanceolate entire leaves, and a long spike of yellowish flowers; petals 4.

13. PITTOSPORACEÆ, PITTOSPORUM FAMILY.

A small family of shrubs and trees, belonging mostly to the southern hemisphere, in common cultivation represented only by one house-plant, a species of

1. PITTÓSPORUM. (Name means *pitchy seed* in Greek, the seeds being generally covered with a sticky exudation.) Flowers regular, of 5 sepals,

5 petals, and 5 stamens; the claws of the petals sometimes slightly united: ovary one-celled with three parietal placentæ, a single style and stigma. Fruit a globular woody pod, many-seeded.

P. Tobìra, Common P. A low tree, cultivated as a house-plant (from Japan), with obovate and retuse evergreen leaves crowded at the end of the branches, which are terminated by a small sessile umbel of white fragrant flowers, produced in winter.

14. VIOLACEÆ, VIOLET FAMILY.

Commonly known only by the principal genus of the order, viz.

1. VÌOLA, VIOLET. (Ancient Latin name.) Sepals 5, persistent. Petals 5, more or less unequal, the lower one with a sac or spur at the base. (Lessons, p. 91, fig. 181, 182.) Stamens 5, short: the very broad flat filaments conniving and slightly cohering around the pistil, which they cover, all but the end of the style and the (usually one-sided) stigma, bearing the anthers on their inner face, two of these spurred at the base. Ovary and pod 1-celled, with 3 parietal placentæ, containing several rather large seeds. — Herbs, with stipules to the alternate leaves, and 1-flowered peduncles.

* Stemless Violets, *with leaves and peduncles all from creeping or subterranean rootstocks, there being no proper ascending stems: all flowering in spring, also producing inconspicuous flowers and most of the fruitful pods, all summer, concealed among the leaves.*

+ *Garden species, from Europe: fragrant.*

V. odoràta, Sweet Violet. Cult. from Eu., the tufts spreading by creeping runners; leaves rounded heart-shaped, more or less downy; flowers purple-blue (violet-color) varying to bluish and white, single or in cultivation commonly full double. Hardy; while the Italian Violet, the variety used for winter-blooming, with leaves smoother and brighter green and flowers paler or grayish-blue, is tender northward.

+ + *Wild species: slightly sweet-scented or scentless.*

++ *Flowers blue or violet-color.*

V. Selkírkii, Selkirk's V. Small, only 2′ high, the rounded heart-shaped leaves spreading flat on the ground; the flower large in proportion, its thick spur nearly as long as the beardless petals: on shady banks, only N.

V. sagittàta, Arrow-leaved V. One of the commonest and earliest; leaves varying from oblong-heart-shaped to ovate and often rather halberd-shaped, the earlier ones on short and margined petioles; flower large in proportion; spur short and sac-shaped, as in all the following.

V. cucullàta, Common Blue V. The tallest and commonest of the blue violets, in all low grounds, with matted fleshy and scaly-toothed rootstocks, erect and heart-shaped or kidney-shaped obscurely serrate leaves, with the sides at the base rolled in when young, on long petioles; flowers sometimes pale or variegated with white.

V. palmàta, Hand-leaf V., is a variety of the last, with the leaves, or all the later ones, 3 – 7-cleft or parted; common southward.

V. pedàta, Bird-foot V. Grows in sandy or light soil, from a short and thick or tuber-like rootstock; the leaves all cut into linear divisions or lobes; the flower large, beardless, usually light violet-color: sometimes the two upper petals deep dark violet, like a pansy.

V. delphinifòlia, Larkspur-leaved V., takes the place of the preceding in prairies, &c. W. and is like it, but has the lateral petals bearded.

++ ++ *Flowers (small) white, the lower petal purplish-veined.*

V. blànda, Sweet White V. Very common, with faintly sweet-scented flowers, all the petals beardless; leaves rounded heart-shaped or kidney-shaped.

V. primulæfòlia, Primrose-leaved V. Common S., between the last and next, has oblong or ovate leaves.

V. lanceolàta, Lance-leaved V. Commonest S., has lanceolate leaves tapering into long petioles, and beardless petals.

++ ++ ++ *Flowers yellow.*

V. rotundifòlia, ROUND-LEAVED V. Only in cold woods N.; the roundish heart-shaped leaves flat on the ground, becoming large and shining in summer; spreads by runners; flower small.

* * LEAFY-STEMMED VIOLETS, *wild, perennial: flowering in spring and summer.*

+ *Flowers yellow, short-spurred: stem 2 – 4-leaved above, naked below.*

V. pubéscens, DOWNY YELLOW V. Common in rich woods; soft-downy, also a rather smooth variety; leaves broadly heart-shaped.

V. hastàta, HALBERD-LEAVED V. Scarce W. & S.; smoother; leaves oblong-heart-shaped, halberd-shaped, or 3-lobed; flower small.

+ + *Flowers not yellow: stem branched, leafy below: leaves rounded heart-shaped.*

V. striàta, PALE V. Not rare N. & W., low; flowers creamy-white, with lower petal purple-lined; spur short; stipules large in proportion, strongly fringe-toothed.

V. canina, DOG V., the Amer. variety: common in low grounds; low, with creeping branches or short runners, fringe-toothed stipules, and spur half the length of the violet flower.

V. rostràta, LONG-SPURRED V. Shady hills N. & W.; 6′ high, with fringe-toothed stipules, and slender spur longer than the pale violet petals.

V. Canadénsis, CANADA V. Common in rich woods N. & W., taller than the others, 1° – 2° high, larger-leaved, with entire stipules; flowers all summer, the petals white or purplish above, the upper ones violet-purple underneath; spur very short and blunt.

* * * PANSY VIOLETS, *from Europe, with leafy and branching stems, and large leaf-like stipules: flowering through the spring and summer.*

V. trícolor, PANSY or HEART'S-EASE. Cult. or running wild in gardens, low, with roundish leaves, or the upper oval and lowest heart-shaped; stipules lyrate-pinnatifid; petals of various colors, and often variegated, and under cultivation often very large and showy, the spur short and blunt. — Var. ARVÉNSIS, is a field variety, slender and small-flowered, thoroughly naturalized in some places. ① ② ♃

V. cornùta, HORNED V. From the Pyrenees, cult. in borders of late; has stipules merely toothed, and light violet-purple flowers with a very long and slender spur. ♃

15. DROSERACEÆ, SUNDEW FAMILY.

Bog-herbs, with regular flowers, on scapes; leaves in a tuft at the root, glandular-bristly or bristly-fringed, and rolled up from the apex in the bud, in the manner of Ferns; the persistent sepals and withering-persistent petals each 5; stamens 5 – 15 with their anthers turned outward; and a 1-celled many-seeded pod. Represented by two genera.

1. DROSERA. Stamens 5. Styles 3 – 5, but 2-parted so as to seem like 6 – 10. Ovary with 3 parietal placentæ. Reddish-colored and sticky-glandular.
2. DIONÆA. Stamens 15. Style 1: stigma lobed and fringed. Ovules and seeds all at the broad base of the ovary and pod. Leaves terminated by a bristly-bordered fly-trap.

1. DRÓSERA, SUNDEW. (Name means in Greek *dewy*, or *beset with dew-drops*, the gland surmounting the bristles of the leaves producing a clear and dew-like drop of liquid, which is glutinous, and serves to catch small flies.) Flowers small, in a 1-sided spike or raceme, each opening only once, in sunshine, in summer. ♃

* *Flowers small, white: leaves with a blade.*

D. rotundifòlia, ROUND-LEAVED S. The commonest species in peat-bogs, white round leaves on long petioles spreading in a tuft. When a small fly or other insect is caught by the sticky glands on the upper face of the leaf,

the bristles of the outer rows very slowly turn inwards, so that their glands help to hold the prey!

D. longifòlia, LONGER-LEAVED S. In very wet bogs or shallow water, with spatulate-oblong leaves, some of them erect, on long petioles.

D. brevifòlia, SHORT-LEAVED S. In wet sand, only at the S.; small; scape only 2′ – 5′ high, few-flowered; leaves short, wedge-shaped.

* * *Flowers rose-purple: no blade to the leaf.*

D. filifòlia, THREAD-LEAVED S. In wet sandy soil near the coast, from Plymouth, Mass., to Florida; leaves erect, thread-shaped; scape 6′ – 12′ high, from a bulb-like base; flowers handsome, ½′ or more broad.

2. DIONÆA, VENUS'S FLY-TRAP. (Named for the mother of Venus.) ♃ Only one species,

D. muscípula. Grows only in sandy bogs near Wilmington, N. Car., but kept in conservatories as a great curiosity. (See Lessons, p. 52, fig. 81, for the leaves, and the way they catch insects!) Flowers white, borne in an umbel-like cyme on a scape 1° high, in spring.

16. CISTACEÆ, ROCK-ROSE FAMILY.

Shrubby or low herbaceous plants, with regular flowers; a persistent calyx of 5 sepals, two of them exterior and resembling bracts; the petals and stamens on the receptacle; the style single or none; ovary 1-celled with 3 or 5 parietal placentæ (Lessons, fig. 261), bearing orthotropous ovules. Represented in greenhouses by one showy species, CISTUS LADANIFERUS of Europe (not common), and in sandy woods and fields by the following wild plants.

1. HELIANTHEMUM. Petals 5, crumpled in the bud, fugacious (falling at the close of the first day). Stamens and ovules many in the complete flower: placentæ 3. Style none or short.
2. HUDSONIA. Petals as in the last. Calyx narrow. Stamens 9 – 30. Style slender. Ovules few.
3. LECHEA. Petals 3, persistent, not longer than the calyx. Stamens 3 – 12. Style none. Pod partly 3-celled, 6-seeded.

1. HELIÁNTHEMUM, FROSTWEED. (Name from Greek words for *sun* and *flower*, the blossoms opening only in sunshine. Popular name, from crystals of ice shooting from the cracked bark at the root late in the autumn.) Low, yellow-flowered, in sandy or gravelly soil. ♃

H. Canadénse, CANADIAN or COMMON F. Common, and the only one N.; has lance-oblong leaves hoary beneath; flowers produced all summer, some with showy corolla 1′ broad and many stamens; others small and clustered along the stem, with inconspicuous corolla and 3 – 10 stamens; the latter produce small few-seeded pods.

H. corymbòsum, only along the coast S., is downy all over, with smaller flowers clustered at the top of the stem, and larger ones long-peduncled.

H. Caroliniànum, grows only S., is hairy, with green leaves, the lower obovate and clustered; flowers all large-petalled and scattered, in spring.

2. HUDSÒNIA. (For an English botanist, *William Hudson*.) Heath-like little shrubs, 6′ – 12′ high, nearly confined to sandy shores of the ocean and Great Lakes, with minute downy leaves closely covering the branches, and small yellow flowers, opening in sunshine, in spring and summer.

H. ericoìdes, HEATH-LIKE H. Greenish; leaves awl-shaped; flowers peduncled. From New Jersey N.

H. tomentòsa, DOWNY H. Hoary with soft down; leaves oblong or oval and close pressed; peduncles short or hardly any. From New Jersey to Maine and Lake Superior.

3. LÉCHEA, PINWEED. (For *Leche*, a Swedish botanist.) Small, homely herbs, with inconspicuous greenish or purplish flowers, and pods about the size of a pin's head, whence the popular name: common in sterile soil; fl. summer and autumn. ♃

L. màjor, LARGER P. Stem upright, hairy, 1° - 2° high; leaves elliptical, mucronate; flowers densely clustered. Borders of sterile woodlands.

L. mìnor, SMALLER P. Stems low, 6′ - 18′ high, often straggling, minutely hairy; leaves linear; flowers loosely racemed on the branches. Open sterile ground.

17. HYPERICACEÆ, ST. JOHN'S-WORT FAMILY.

Distinguished from all other of our plants by the opposite and entire simple and chiefly sessile leaves, punctate with translucent and commonly some blackish dots, perfect flowers with the stamens (usually many and more or less in 3 or 5 clusters) inserted on the receptacle, and a pod either 1-celled with parietal placentæ or 3-5-celled (see Lessons, p. 120, fig. 260, 262, 263), filled with many small seeds. Juice resinous and acrid. All here described are wild plants of the country.

* *No glands between the stamens. Petals convolute in the bud.*

1. ASCYRUM. Sepals 4; the outer pair very broad, the inner small and narrow. Petals 4, yellow. Stamens many. Ovary 1-celled.
2. HYPERICUM. Sepals and (yellow) petals 5. Stamens many, rarely few.

* * *Large gland between each of the 3 sets of stamens Petals imbricated in the bud.*

3. ELODES. Sepals and erect flesh-colored. Petals 5. Stamens 9 to 12, united in 3 sets. Ovary 3-celled. Flowers axillary.

1. ÁSCYRUM, ST. PETER'S-WORT. (Greek name means without roughness, being smooth plants.) Leafy-stemmed, woody at the base, with 2-edged branches; wild in pine barrens, &c., chiefly S. Fl. summer. ♃

* *A pair of bractlets on the pedicel: styles short.*

A. Crux-Ándreæ, ST. ANDREW'S CROSS. From New Jersey to Illinois & S.; stems spreading; leaves thinnish, narrow-oblong and tapering to the base; flowers rather small, with narrow pale yellow petals and only 2 styles.

A. stans, COMMON ST. PETER'S-WORT. From New Jersey S.; stems 2° - 3° high; leaves thickish, closely sessile, oval or oblong; flowers larger, with obovate petals and 3 or 4 styles.

* * *No bractlets on the pedicel: styles longer than ovary.*

A. amplexicaùle, CLASPING-LEAVED S. Only found S., with erect stems many times forking above, and closely sessile heart-shaped leaves; styles 3.

2. HYPÉRICUM, ST. JOHN'S-WORT. (Ancient name, of uncertain derivation.) Fl. in summer, in all ours yellow.

* *Shrubs or perennial herbs: stamens very many.*

+ *Styles 5 (rarely more) united below into one: pod 5-celled.*

H. pyramidàtum, GREAT-FL. S. Herb, 2° - 4° high, with ovate-oblong partly-clasping leaves, and large flowers, the petals rather narrow, 1′ long, and 5 clusters of stamens. River-banks N. & W.

H. Kalmiànum, KALM'S S. Low shrub, with glaucous oblanceolate leaves and rather large flowers. N. W.: rare, except at Niagara Falls.

+ + *Styles 3 partly united, or at first wholly united to the top into one* (see Lessons, p. 118, fig. 256): *sepals leafy, spreading.*

++ *Shrubby, deciduous-leaved, both Northern and Southern.*

H. prolíficum, SHRUBBY S. Like the last, but leaves scarcely glaucous, lance-oblong or linear; pod 3-celled.

++ ++ *Shrubby, evergreen or nearly so, only Southern.*

H. fasciculàtum, FASCICLED S. Leaves narrow-linear and small, and with shorter ones clustered in the axils; pod narrow. Wet pine barrens.

H. myrtifòlium, MYRTLE-LEAVED S. Leaves heart-shaped and partly clasping, thick, glaucous; pod conical. Wet pine barrens.

H. aùreum, GOLDEN S. Leaves oblong with a narrow base, glaucous beneath; thick; flowers mostly single, very large (2′ broad), orange-yellow; pod ovate. River-banks towards the mountains.

H. nudiflòrum, NAKED-CLUSTERED S. Shrubby and evergreen S., less so in Virginia, &c., has 4-angled branches, oblong pale leaves, and a peduncled naked cyme of rather small flowers; pods conical.

++ ++ ++ *Herbaceous, simple-stemmed, Northern & Western.*

H. sphærocárpon, SPHERICAL-FRUITED S. About 2° high; leaves diverging, oblong-linear (2′ long), obtuse; flowers numerous, small, in a naked flat cyme; sepals ovate; pod globular, 1-celled. Rocky banks, W.

H. adpréssum, UPRIGHT-LEAVED S. A foot high; leaves ascending, lanceolate, often acute; flowers few and rather small; sepals narrow; pod oblong, partly 3-celled. Low grounds, Pennsylvania to Rhode Island.

H. ellípticum, ELLIPTICAL-LEAVED S. Barely 1° high; leaves spreading, oblong, thin; flowers rather few in a nearly naked cyme, pale; the pod purple, oblong-oval, obtuse, 1-celled. Wet soil, N.

+ + + *Styles 3 wholly separate* (see Lessons, fig. 255): *herbs.*

++ *Ovary and pod 3-celled: petals black-dotted: styles mostly diverging.*

H. perforàtum, COMMON S. The only one not indigenous, nat. from Eu., a troublesome weed in fields, &c.; spreads by runners from the base; upright stems branching; leaves oblong or linear-oblong, with pellucid dots; flowers rather large in open leafy cymes; the deep yellow petals twice the length of the lanceolate acute sepals. The juice is very acrid.

H. corymbòsum, CORYMBED S. Common N. in moist ground; stem 2° high, sparingly branched; leaves oblong, slightly clasping, having black as well as pellucid dots; flowers rather small, crowded; petals light yellow and black-lined as well as dotted; sepals oblong; styles not longer than the pod.

H. maculàtum, SPOTTED S. Common S. has somewhat heart-shaped or more clasping leaves, lanceolate sepals, and very long and slender styles: otherwise like the last.

++ ++ *Ovary 1-celled: stem strict: leaves ascending, acute, closely sessile, short.*

H. angulòsum, ANGLED S. Wet pine-barrens from New Jersey S. Stem sharply 4-angled (1°–2° high), smooth; leaves ovate or lance-oblong; flowers scattered along the ascending branches of the cyme, small, copper-yellow; styles slender.

H. pilòsum, HAIRY S. Wet pine-barrens S. Stem terete, and with the lance-ovate leaves roughish-downy; styles short.

* * *Annual, low and slender, small-flowered herbs: stamens 5–12: ovary and brown-purple pod strictly 1-celled: styles 3, separate: sepals narrow, erect: petals narrow.*

+ *Leaves conspicuous and spreading: flowers in cymes.*

H. mùtilum, SMALL S. Slender, much branched and leafy up to the flowers; leaves partly clasping, thin, 5-nerved, ovate or oblong; petals pale yellow. Everywhere in low grounds.

H. Canadénse, CANADIAN S. Stem and branches strictly erect; leaves linear or lanceolate, 3-nerved at the base; petals copper-yellow. Wet sandy soil.

+ + *Leaves erect, awl-shaped or scale-like and minute: flowers very small and scattered along the numerous bushy and wiry slender branches.*

H. Drummóndii, DRUMMOND'S S. In dry barrens, W. Illinois and S., with linear-awl-shaped leaves, short-pedicelled flowers, and pods not longer than the calyx.

H. Saròthra, ORANGE-GRASS or PINE-WEED. Common in dry sterile soil, with minute awl-shaped appressed scales for leaves, flowers sessile on the wiry branches, and slender pods much exceeding the calyx.

3. **ELÒDES,** MARSH ST. JOHN'S-WORT. (Greek for *marshy*.) In water or wet bogs, with pale often purple-veined oblong or ovate leaves, and close clusters of small flowers in their axils, produced all summer. Petals pale purple or flesh-color, equal-sided, erect. ♃

E. Virginica, the commonest, has the roundish or broadly oblong leaves clasping by a broad base.

E. petiolàta, commoner S., has the leaves tapering into a short petiole.

18. ELATINACEÆ, WATER-WORT FAMILY.

Little marsh annuals, resembling Chickweeds, but with membranaceous stipules between the opposite leaves, and seeds as in preceding family. Represented by

1. **ELÁTINE,** WATER-WORT. (Greek name of some herb.) Sepals, petals, stamens and cells of the ovary and stigmas or styles of the same number, each 2, 3, or 4, all separate on the receptacle. Seeds straightish or curved. Flowers minute in the axils of the leaves.

E. Americàna. Creeping and spreading on muddy shores of ponds, &c., about 1′ high, not very common; leaves obovate; parts of the flower 2, rarely 3; pod very thin.

19. TAMARISCINEÆ, TAMARISK FAMILY.

Shrubs or small trees of the Old World, represented in ornamental grounds by

1. **TÁMARIX,** TAMARISK. (Named for the *Tamarisci*, or the river *Tamaris*, on which these people lived.) Sepals and petals 4 or 5, persistent, or the latter withering, and stamens as many or twice as many, all on the receptacle. Ovary pointed, 1-celled, bearing many ovules on three parietal placentæ next the base: styles 3. Seeds with a plume of hairs at the apex. Shrubs or small trees of peculiar aspect, with minute and scale-shaped or awl-shaped alternate leaves appressed on the slender branches, and small white or purplish flowers in spikes or racemes. The only one planted is

T. Gállica, FRENCH T. Barely hardy N., often killed to the ground, a picturesque, delicate shrub, rather Cypress-like in aspect, glaucous-whitish, the minute leaves clasping the branches, nearly evergreen where the climate permits.

20. CARYOPHYLLACEÆ, PINK FAMILY.

Bland herbs, with opposite entire leaves, regular flowers with not over 10 stamens, a commonly 1-celled ovary with the ovules rising from the bottom of the cell or on a central column, and with 2–5 styles or sessile stigmas, mostly separate to the base. (See Lessons, p. 120, fig. 258, 259.) Seeds with a slender embryo on the outside of a mealy albumen, and usually curved into a ring around it. Calyx persistent. Petals sometimes minute or wanting. Divides into two great divisions or suborders, viz. the true PINK FAMILY, and the CHICKWEED FAMILY, to the latter of which many plants like them, but mostly single-seeded and without petals, are appended.

I. PINK FAMILY PROPER. Sepals (5) united below into a tube or cup. Petals with slender claws which are enclosed in the calyx-tube, and commonly raised within it, with the 10 stamens, on a sort of stalk, often with a cleft scale or crown at the junction of the blade and claw. (Lessons, p. 101, fig. 200.) Pod mostly opening at the top, many-seeded.

* *Calyx with a scaly cup or set of bracts at its base: styles 2.*

1. DIANTHUS. Calyx cylindrical, faintly many-striate. Petals without a crown. Seeds attached by the face: embryo in the albumen and nearly straight!

* * *Calyx naked at base: seeds attached by the edge: embryo curved.*

2. LYCHNIS. Styles 5, rarely 4. Calyx not angled, but mostly 10-nerved.
3. SILENE. Styles 3. Calyx not angled, mostly 10-nerved.
4. VACCARIA. Styles 2. Calyx pyramidal, becoming 5-wing-angled.
5. SAPONARIA. Styles 2. Calyx cylindrical or oblong, not angled, 5-toothed. Pod 4-valved at the top.
6. GYPSOPHILA. Styles 2. Calyx bell-shaped, 5-cleft, or thin and delicate below the sinuses. Pod 4-valved. Flowers small and panicled, resembling those of Sandwort, &c.

II. CHICKWEED FAMILY, &c. Petals spreading, without claws, occasionally wanting. Sepals (4 or 5) separate or united only at base, or rarely higher up. Flowers small, compared with the Pink Family, and the plants usually low and spreading or tufted.

* *Without stipules, generally with petals: pod several-seeded.*

7. SAGINA. Styles and valves of the pod as many as the sepals and alternate with them (4 or 5). Petals entire or none. Small plants.
8. CERASTIUM. Styles as many as the sepals and opposite them (5). Petals notched at the end or 2-cleft, rarely none. Pod mostly elongated, opening at the top by 10 teeth.
9. STELLARIA. Styles fewer than the sepals (3 or sometimes 4) and opposite as many of them. Petals 2-cleft, or sometimes none. Pod globular or ovoid, splitting into twice as many valves as there are styles.
10. ARENARIA. Styles (commonly only 3) fewer than the sepals and opposite as many of them. Petals entire, rarely none. Pod globular or oblong, splitting into as many or twice as many valves as there are styles.

* * *With scarious stipules between the leaves, conspicuous and entire petals, and a many-seeded 3 – 5-valved pod.*

11. SPERGULARIA. Styles usually 3. Leaves opposite.
12. SPERGULA. Styles 5, as many as the sepals and alternate with them. Leaves in whorls.

* * * *Without petals: the fruit (utricle) 1-seeded and indehiscent.*

13. ANYCHIA. Sepals 5, nearly distinct. Stamens 2 – 5. Stigmas 2, sessile. Stipules and flowers minute.
14. SCLERANTHUS. Sepals (5) united below into an indurated cup, narrowed at the throat where it bears 5 or 10 stamens, enclosing the small utricle. Styles 2. Stipules none.

* * * * *Without petals, but the 5 sepals white and petal-like inside: stipules obscure if any: fruit a 3-celled many-seeded pod.*

15. MOLLUGO. Stamens generally 3, on the receptacle. Stigmas 3. Pod 3-valved, the partitions breaking away from the seed-bearing axis and adhering to the middle of the valves.

1. DIÁNTHUS, PINK. (Greek name, meaning Jove's own flower.) All but the first species cultivated for ornament: fl. summer.

* *Flowers sessile and many in a close cluster, with long and narrow-pointed bracts under the calyx, except in the last.*

D. Armèria, DEPTFORD PINK of Europe, has got introduced into fields in a few places; a rather insignificant plant, somewhat hairy, narrow-leaved, with very small scentless flowers; petals rose-color with whitish dots. ①

D. barbàtus, SWEET WILLIAM or BUNCH PINK, of Europe, with thinnish oblong-lanceolate green leaves, and a very flat-topped cluster of various-colored flowers, the petals sharply toothed, abounds in all country gardens; the many double-flowered varieties are more choice. ♃

D. Carthusianòrum, CARTHUSIANS' PINK, from Eu., has linear leaves, slender stems, and a dense cluster of small flowers; bracts ovate or oblong, abruptly awn-tipped, brown, shorter than the calyx; petals merely toothed, short, usually dark purple or crimson: now rather scarce in gardens. ♃

* * *Flowers single at the ends of the branches: leaves narrow and often grass-like, rather rigid, glabrous and glaucous, usually without any evident veins.*

D. Chinénsis, China or Indian Pink, has lanceolate leaves, less rigid and greener than any of the following, and linear acute scales or bracts as long as the calyx; the large petals toothed or cut, of various colors, red, purple, violet, &c. The garden var. Heddewigii is a more glaucous and large-flowered form, lately introduced. ① ②

D. Caryophýllus, Clove Pink, the parent of all the sorts of Carnation, &c., has the stems almost woody below, very glaucous long-linear leaves; the scales under the calyx very short and broad; petals merely toothed, of various colors. Scarcely hardy N. ♃

D. plumàrius, Pheasant's-eye or Plumed Pink. A low, hardy species, making broad tufts, with small very glaucous leaves, sending up flower-stems in early summer, the white or pink or variegated petals cut into a fringe of slender lobes. ♃

D. supérbus, is taller, less tufted, and later-flowered; the large petals entirely dissected into delicate almost capillary divisions. ♃

2. LÝCHNIS. (Greek name for *lamp*, the down of the Mullein Lychnis having been used for wicking.) All from the Old World: fl. summer.

§ 1. *Calyx with long leaf-like lobes: petals naked.* ①

L. Githàgo, Corn-Cockle. A weed in grain-fields, hairy, with long linear leaves, and long-peduncled showy red-purple flowers; in fruit the calyx-lobes falling off; the black seeds injurious to the grain.

§ 2. *Calyx without long leaf-like lobes: petals crowned with a 2-cleft little scale or pair of teeth on the base of the blade or at the top of the claw.* ♃

L. coronària, Mullein-Lychnis or Mullein Pink. Cult. in gardens; the flower crimson and like that of Corn-Cockle; but teeth of the calyx short and slender; plant white-cottony; leaves oval or oblong. ② ♃

L. Flos-Jòvis, Jupiter's L. Less common in gardens, downy-hairy or cottony and whitish; leaves lance-oblong; flowers many and smaller, in a head-like long-peduncled cluster, reddish-purple; petals obcordate.

L. Chalcedónica, Maltese-Cross or Scarlet L. Very common in country-gardens; tall, rather hairy and coarse, with lance-ovate partly clasping green leaves, and a very dense flat-topped cluster of many smallish flowers; the bright scarlet or brick-red petals deeply 2-lobed.

L. grandiflòra, Large-flowered L. Cult from China; smooth, with oblong green leaves tapering to both ends, and the branches bearing single or scattered short-peduncled flowers, which are 2′ or 3′ across; the red or scarlet petals fringe-toothed at the end.

L. Viscària, Viscid L. Rather scarce in gardens; smooth, but the slender stem glutinous towards the top; leaves linear; flowers many in a narrow raceme-like cluster, rather small; calyx tubular or club-shaped; petals pink-red, slightly notched: also a double-flowered variety.

L. Flos-cùculi, Cuckoo L. Ragged Robin is the double-flowered variety, in gardens; slightly downy and glutinous, with lanceolate leaves, and an open panicle of pink-red petals, these cleft into 4 narrow-linear lobes.

L. diúrna, Day-blooming L. Double-flowered form also called Ragged Robin in the gardens; smoothish or soft-hairy; leaves oblong or lance-ovate, the upper ones pointed; flowers scattered or somewhat clustered on the branches, rose-red.

L. vespertina, Evening-blooming L. A weed in some waste grounds, like the last, and more like the Night-flowering Catchfly; but has 5 styles and a more ovate enlarging calyx; the flowers are commonly diœcious, white, and open after sunset, the root biennial. But a full double-flowering variety in gardens is perennial, day-flowering, and is a white sort of Ragged Robin.

3. SILÈNE, CATCHFLY. (Both names refer to the sticky exudation on stems and calyx of several species, by which small insects are often caught.) Besides the following, some other wild or cultivated species are met with, but not common. Fl. mostly all summer.

* *All over sticky-hairy: naturalized from Europe.* ①

S. noctiflòra, Night-flowering C. Tall coarse weed in cult. or waste grounds; lower leaves spatulate, upper lanceolate and pointed; flowers single or in loose clusters terminating the branches, with awl-shaped calyx-teeth and white or pale rosy 2-parted petals, opening at nightfall or in cloudy weather.

* * *Smooth, a part of each of the upper joint of stem glutinous: flowers small.* ①

S. Armèria, Sweet-William C. In old gardens or running wild, from Europe; stem about 1° high, branching into flat-topped cymes of many flowers, which are rather showy; calyx club-shaped; petals notched, bright pink, or a white variety, opening only in sunshine; leaves lance-ovate, glaucous.

S. antirrhina, Sleepy C. Wild in sandy or gravelly soil; stem slender, 6′ – 20′ high, rather simple; flowers very small, panicled; calyx ovoid; petals rose-color, obcordate, opening only at midday in sunshine; leaves lanceolate or linear.

* * * *Somewhat sticky-pubescent, at least the calyx, which is oblong, tubular, or club-shaped: wild species, with red or pink showy flowers.* ♃

S. Pennsylvánica, Pennsylvanian C. or Wild Pink. In gravelly soil; stems 4′ – 8′ high, bearing 2 or 3 pairs of lanceolate leaves and a cluster of short-stalked middle-sized flowers, in spring; petals pink-red, wedge-shaped, slightly notched.

S. Virgínica, Virginian C. or Fire Pink. In open woods W. & S.; 1° – 2° high; leaves spatulate or lanceolate; flowers few, peduncled; the pretty large bright crimson-red petals 2-cleft.

S. règia, Royal C. Prairies, &c., from Ohio S.; like the last, but 3° high, with lance-ovate leaves, numerous short-peduncled flowers in a narrow panicle, and narrower scarlet-red petals scarcely cleft.

* * * * *Not sticky: calyx inflated and bladdery: petals rather small, white.* ♃

S. stellàta, Starry Campion. Wild on wooded banks; stem slender, 2° – 3° high; leaves in whorls of 4, lance-ovate, pointed; flowers in a long and narrow panicle; petals cut into a fringe.

S. inflàta, Bladder Campion. Wild in fields E., but nat. from Eu., glaucous or pale and very smooth, 1° high, with ovate-lanceolate or oblong leaves, and an open cyme of flowers; the bladdery calyx veiny; petals 2-cleft.

4. VACCÀRIA, COW-HERB. (Name from Latin *vacca*, a cow.) ①

V. vulgàris, Common C. In gardens or running wild near them, from Eu.; smooth, 1° – 2° high, with pale lanceolate partly clasping leaves, and a loose open cyme of flowers; petals pale red, naked, not notched; fl. summer.

5. SAPONÀRIA, SOAPWORT. (Latin and common names from the mucilaginous juice of the stem and root forming a lather.) From Europe.

S. officinàlis, Common S. or Bouncing Bet. A rather stout, 1° – 2° high, nearly smooth herb, in gardens, and running wild by roadsides; leaves 3 – 5-ribbed, the lower ovate or oval, upper lanceolate; flowers rather large, clustered; petals pale rose-color or almost white, notched at the end. The double-flowered is most common. ♃

6. GYPSÓPHILA. (From Greek words meaning lover of *gypsum* or *chalk*, growing on calcareous rocks.) Plants with the small and often panicled flowers and foliage of Arenaria or Stellaria, but the sepals united into a cup as in the true Pink Family, usually by their thin white edges, however, so that to a casual glance they may appear distinct. Cult. in choicer gardens, from Eu. and the East, ornamental, especially for dressing cut flowers, &c. Fl. all summer.

G. paniculàta, Panicled G. Very smooth, pale, 1° – 2° high; with lance-linear leaves, and branches repeated forking into very loose and light cymes, bearing innumerable very small and delicate white flowers. ♃

G. élegans, Elegant G. Less tall or low, loosely spreading; with lanceolate leaves, much larger (½′ broad) and fewer flowers, white or slightly rosy. ①

7. SAGÌNA, PEARLWORT. (Latin name, means *rich nourishment*, which, however, these small and insignificant plants can hardly be.) There are four or five species in the country, none very common; the most so is

S. procúmbens. Springy places and damp shores, &c., N.; a smooth little plant, tufted and spreading, 1′ – 3′ high, with almost thread-shaped leaves; the blunt sepals, short white petals, stamens, and styles 4 or rarely 5.

8. CERÁSTIUM, MOUSE-EAR CHICKWEED. (Name in Greek refers to the horn-shaped pod of some species. The popular name is from the shape and soft hairiness of the leaves of the common species.)

* *Flowers inconspicuous, the deeply 2-cleft petals being shorter or little longer than the calyx: the pods becoming much longer and curving more or less. Flowering all summer, white.*

C. vulgàtum, COMMON M., from Penn. S., but scarce N., in grassy places. An insignificant soft-hairy weed; stems erect, 4′ – 9′ high, slightly clammy; leaves ovate or obovate, small; pedicels even in fruit and petals shorter than the calyx. ①

C. viscòsum, CLAMMY M. Common in grassy places; stems spreading, 6′ – 15′ long, clammy-hairy; leaves oblong; pedicels becoming longer than the calyx; petals as long as the calyx. ② ♃

C. nùtans, NODDING-FRUITED M. Common in moist or shady grounds, wild. Clammy-pubescent, erect, 6′ – 18′ high, becoming very loosely-flowered and branched; leaves oblong-lanceolate; petals longer than calyx; pods long, nodding on the slender flower-stalk and curved upwards. ①

* * *Flowers conspicuous, the snowy white petals 2 or 3 times the length of the calyx: pod shorter: plants forming matted tufts.* ♃

C. arvénse, FIELD M. Dry fields, &c. Downy but green; leaves varying from narrow-oblong to linear; flowering stems 4′ – 6′ high, few-flowered; petals notched at the end.

C. tomentòsum, COTTONY M. Cult. from Eu. for borders, &c., its spreading shoots, crowded with oblong white-woolly leaves, making dense silvery mats; petals deeply 2-cleft.

9. STELLÀRIA, STARWORT-CHICKWEED. (Name from Latin *stella*, a star.) Petals white, but sometimes small or none. Fl. spring and summer. None cultivated; but the first is a weed in every garden.

* *Stems weak and spreading, marked with pubescent lines: leaves broad.*

S. mèdia, COMMON S. or CHICKWEED. In all damp cult. grounds; leaves ovate or oblong, the lower on hairy petioles; petals shorter than the calyx, 2-parted; stamens 3 – 10. ①

S. pùbera, GREAT S. Shaded rocks, wild from Penn. S. & W.; leaves oblong or oval, sessile; petals longer than the calyx, 2-cleft.

* * *Stems erect or spreading, and whole plant smooth: leaves narrow, sessile.* ♃

S. longifòlia, LONG-LEAVED S. or STITCHWORT. Common in damp grassy places N.; stem weak, 8′ – 18′ high; leaves linear, widely spreading; flowers numerous on slender spreading pedicels in a very loose cyme; petals 2-parted, longer than the calyx.

S. boreàlis, NORTHERN S. Wet grassy places N.; stem 3′ – 10′ high, forking repeatedly and with flowers in the forks of the leafy branches; leaves broadly lanceolate or narrow-oblong; petals shorter than the calyx, or none.

10. ARENÀRIA, SANDWORT. (So named because several grow in sand or sandy soil.) All the following are wild, also some others less common. Fl. spring and summer.

* *Petals inconspicuous, white.*

A. serpyllifòlia, THYME-LEAVED S. An insignificant little weed, in sandy or gravelly waste places, 2′ – 6′ high; stems erect, roughish, much branched; leaves ovate, pointed; petals scarcely longer than the 3 – 5-nerved pointed sepals. ①

A. diffùsa, SPREADING S. Shady grounds S. Plant soft-downy; stems prostrate, 1° or more long; leaves lanceolate; peduncles lateral, 1-flowered; petals shorter than the sepals or none. ♃

* * *Petals conspicuous, longer than the calyx, white.* ♃

A. lateriflòra, SIDE-FLOWERING S. Gravelly shores and banks N. Plant minutely downy; stem erect, 3′ – 10′ high, sparingly branching; peduncles few-flowered, soon becoming lateral by the farther growth of the leafy stem; leaves oval or oblong.

A. strícta. Rocky or shady banks N. Tufted, smooth, 4′ – 6′ high; stems crowded with slender almost bristle-form leaves; flowers several in a terminal open cyme; sepals sharp-pointed.

A. squarròsa, PINE-BARREN S. In sand, coast of New Jersey and S. Densely tufted on a deep root, 3′ – 5′ high; leaves much crowded, short, awl-shaped, smooth; the flowering branches or few-flowered peduncles glandular; sepals obtuse.

A. Grœnlándica, MOUNTAIN S. On rocky summits of mountains and N. E. coast. Densely tufted, soft; leaves thread-form; flowering stems 2′ – 4′ high, few-flowered, the flowers large in proportion; petals notched at the end.

A. peploìdes, SEA SANDWORT, in sands of sea-shore N., is large, with very fleshy ovate leaves, and axillary flowers.

11. SPERGULÀRIA, SAND SPURREY. (Name from likeness to *Spergula.*) A sort of Sandworts with scaly-membranaceous stipules, and reddish flowers, produced all summer: chiefly maritime. ① ♃ ?

S. rùbra. The field form of this is common in sand or gravel, along roads and paths, E., quite away from salt water; smoothish, prostrate in tufts; leaves thread-shaped; pod and pink-red corolla hardly exceeding the calyx; seeds rough, wingless, half-obovate.

S. salìna. *Larger and more fleshy, only in brackish sands;* with short peduncles, pale corolla, pod longer than the calyx, and rough obovate-rounded (winged or wingless) seeds.

S. mèdia. Like the last, in salt marshes and sands, but with longer peduncles and smooth seeds.

12. SPÉRGULA, SPURREY. (Latin *spargere,* to scatter, i. e. its seeds.)

S. arvénsis, CORN S. Stems 1° or so high; bearing several thread-shaped leaves in the whorls, and terminating in a panicle of white flowers. A weed in grain-fields, cult. in Europe as a forage plant, sheep being fond of it: fl. summer. ①

13. ANÝCHIA FORKED CHICKWEED. (Name of obscure meaning.) ①

A. dichótoma, a common little herb; in shady places it is smooth and erect, 6′ – 10′ high, with repeatedly forking long-jointed very slender stems, minute short-stalked greenish flowers in the forks, and oval or oblong leaves: in dry or parched soil it is spreading on the ground, short-jointed, narrower-leaved, often pubescent, the flowers more clustered and nearly sessile: all summer.

14. SCLERÁNTHUS, KNAWEL. (From Greek words meaning *hard* and *flower,* referring to the indurated tube of the calyx.)

S. ánnuus, our only species, is nat. from Eu. in gravelly grounds, around gardens, &c., a very pale little herb, 3′ – 5′ high, very much branched and spreading, with short awl-shaped leaves, and greenish small flowers clustered or sessile in the forks, in late summer and autumn.

15. MOLLÙGO, CARPET-WEED. (An old Latin name for some soft plant.) ①

M. verticillàta. A very common, small, prostrate and spreading little weed, in waste gravelly soil, gardens, &c., with spatulate leaves and 1-flowered pedicels in clusters or whorls at the joints; the sepals white inside; stamens 3: fl. all summer.

21. PORTULACACEÆ, PURSLANE FAMILY.

Succulent-leaved herbs, with 2 sepals and 5 petals, the stamens sometimes many, sometimes few, and then one before each petal; ovary 1-celled, becoming a pod, with many or few kidney-shaped seeds on a central placenta, or on slender seed-stalks from the base. Seeds as in the Pink Family.

1. PORTULACA. Stamens more numerous than the petals. Style cleft into several slender divisions. Lower part of the ovary and many-seeded pod united with the bottom of the calyx; the upper part when mature falling off as a lid. Flowers opening only once, in sunshine.
2. TALINUM. Stamens more numerous than the petals. Style 3-lobed at the summit. Calyx free from the ovary, deciduous. Pod 3-valved, many-seeded. Flowers opening only once, in sunshine.
3. CALANDRINIA. Stamens numerous. Style 3-cleft at the summit. Calyx free from the ovary, persistent, enclosing the 3-valved many-seeded pod. Flowers opening only once, in sunshine.
4. CLAYTONIA. Stamens 5, one attached to the base of each petal. Style 3-cleft at the summit. Calyx persistent, free from the few-seeded pod. Flowers usually opening for more than one day.

1. PORTULÀCA, PURSLANE. (Old Latin name for Purslane.) Leafy and branching, low and spreading, with fleshy sessile leaves; fl. all summer. (Lessons, p. 103, fig. 214.) ①

P. oleràcea, COMMON P. Very smooth, with prostrate stems, obovate or wedge-form leaves, and small sessile flowers opening only in bright sunshine and for a short time; the petals pale yellow. The commonest garden weed, sometimes used as a pot-herb.

P. pilòsa, HAIRY P. Wild far S., has linear terete leaves, with a tuft of beard-like hairs in the axils, and rather large pink flowers.

P. grandiflòra, GREAT-FLOWERED P., is probably a variety of the last, from South America, commonly cult. for ornament; the large very showy flowers brilliant purple, crimson, red, sometimes white or yellow, or with light centre, of many shades or variations.

2. TALÌNUM. (Name unexplained.) One wild species in some places.

T. teretifòlium, TERETE-LEAVED T. Low and smooth, with thick and fleshy root, short stems bearing crowded linear terete leaves, and a slender naked peduncle, many-flowered; petals rose-purple. Serpentine rocks, Pennsylvania, and rarer west and south: fl. all summer. ♃

3. CALANDRÌNIA. (Named for a Swiss botanist, *Calandrini*.) Cultivated for ornament in choice gardens: fl. all summer.

C. díscolor. Cult. as an annual, from Chili; very glabrous, making a rosette of fleshy spatulate leaves at the root (these glaucous above and tinged with purple beneath) and sending up a naked flower-stem, bearing a raceme of large rose-purple flowers, 2′ in diameter.

C. Menzièsii, MENZIES' C. Low, spreading, leafy-stemmed annual, from Oregon and California, with bright green and tender lance-spatulate leaves, and crimson flowers (nearly 1′ broad) in a short leafy raceme.

4. CLAYTÒNIA, SPRING BEAUTY. (Named for *John Clayton*, an early botanist in Virginia.) Low, smooth herbs: ours producing only a pair of stem leaves and a short raceme of flowers.

* *Stem simple from a round tuber: leaves separate: fl. early spring.* ♃

C. Virgínica, NARROW-LEAVED S. In moist woods, one of the prettiest spring flowers; petals rose-color with pink veins; leaves linear-lanceolate.

C. Caroliniàna, BROADER-LEAVED S. In rich woods; commonest N and along the Alleghanies, smaller than the other, with oblong-spatulate or lance-oblong leaves only 1′ or 2′ long.

flowers 1½′ in diameter, the petals pale rose-color or white, striped with dark purple or violet veins. ①

M. sylvéstris, High M. Gardens and roadsides; 2° – 3° high, branching, *with rather sharply 5 – 7-lobed leaves, and purple-rose-colored flowers rather smaller than in the last*; fruit wrinkled-veiny. ② ♃

M. Alcea. Gardens; 2° – 4° high, hairy, with stem-leaves parted almost to the base into 3 – 5 divisions which are again 3 – 5-cleft or cut-toothed; and showy flowers in clusters or terminal racemes; corolla deep rose-color, 1½′ – 2′ broad; fruit smooth, minutely wrinkled-veiny. ♃

M. moschàta, Musk M. Gardens, and escaped to roadsides, 1° – 2° high, rather hairy, with the herbage faintly musk-scented, leaves about thrice *parted or cut into slender linear lobes, and short-peduncled flowers somewhat clustered or racemed*; corolla 1½′ broad, rose-color or white; fruit downy.

6. CALLÍRRHOË. (A Greek mythological name, applied to N. American plants.) Species chiefly farther W. and S., becoming rather common in choice gardens. Flowers crimson, mauve, or red-purple, very showy, produced all summer.

* *Root thick, often turnip-shaped, farinaceous: stems roughish-hairy or smoothish.* ♃

C. triangulàta. Dry prairies from Wisconsin S.; stems erect, 2° high; leaves triangular, halberd-shaped, or the lowest heart-shaped, the upper cut-lobed or 3 – 5-cleft; flowers somewhat panicled and short-peduncled; involucre as long as the calyx; corolla 1½′ or less in diameter; carpels of the fruit even *on the back, tipped with a short point.*

C. involucràta. Wild from plains of Nebraska S., and cult. for ornament; stems spreading on the ground, 1° – 3° long; stipules conspicuous; leaves rounded, 5-parted or cleft and cut-lobed, shorter than the axillary peduncles; involucre shorter than the calyx; corolla 2′ or more broad; carpels of the fruit reticulated, tipped with a flat and inconspicuous beak.

C. Papàver. Wild in rich woodlands from Georgia to Texas, and sparingly cult.; stems short, ascending, few-leaved; leaves 3 – 5-parted with lance-linear divisions, *or the lowest rather heart-shaped and cleft into oblong lobes*; axillary peduncles very (often 1°) long; involucre of 1 – 3 bracts or none; corolla 2′ or more broad; carpels of the fruit wrinkled or reticulated and with a stout incurved beak.

C. digitàta. Wild in prairies of Arkansas and Texas; 1° high; leaves mostly from the root, 5 – 7-parted into long linear sometimes 2 – 3-cleft divisions; peduncles long and slender; involucre none; corolla 1½′ – 2′ broad, the petals fringe-toothed at the end; fruit nearly as in the last.

* * *Root slender or tapering: herbage smooth.* ① ②

C. pedàta. Wild in E. Texas; not rare cult.; stem erect, 1° – 5° high, leafy; leaves rounded, 3 – 7-lobed or parted and the wedge-shaped divisions cleft or cut; peduncles slender, longer than the leaves; involucre none; corolla about 1½′ broad, the petals minutely eroded at the end; carpels of the fruit smooth and even on the back, and with a stout conspicuous beak.

7. NAPÆA, Glade-Mallow. (From Greek name for *glade* or *nymph of the groves*.) Only one species,

N. dioica. In valleys, chiefly in limestone districts of Penn., Virginia, and W. A rather coarse, roughish herb; *stem 4° – 7° high; leaves 9 – 11-parted* and their lobes cut and toothed, the lowest often 1° in diameter; flowers small, in panicled corymbs, in summer.

8. ÁNODA. (Origin of the name obscure.) Low herbs from Mexico, Texas, &c., sparingly cult. for ornament. Stems, &c. hirsute: peduncles long and slender, 1-flowered. Fruit in the form of a many-rayed star, supported by the spreading 5-rayed calyx: when ripe the rim of each carpel falls away with the seed it embraces, the sides or partitions disappearing. ①

A. hastàta has mostly halberd-shaped leaves, and blue or violet corolla only 1′ – 1½′ in diameter; lobes of the calyx ovate, scarcely pointed.

A. cristàta has mostly triangular or obscurely halberd-shaped and toothed leaves, and purple or rose-colored corolla 2′ in diameter; lobes of the calyx triangular, taper-pointed.

9. SÌDA. (Ancient name, of obscure meaning.) Mostly rather small-flowered or weedy herbs, with 5–12 styles and carpels: fl. summer and autumn.

* *Peduncles axillary, 1-flowered: corolla yellow.*

S. spinòsa. So named from the little pointed projection or tubercle at the base of the petiole, but which can hardly be called a spine; stems much branched, 10′–20′ high; leaves lance-ovate, serrate, minutely soft-downy; peduncles very short; flower very small; pod ovate, of 5 carpels, each splitting at top into 2 points. A common weed S. of New York. ①

S. rhombifòlia. But the leaves are hardly rhombic, usually lance-oblong, short-petioled, serrate, pale and whitish downy beneath; stems 1°–3° high, much branched; peduncles rather long; flower small; fruit of 10 or 12 one-pointed carpels. A weed only S. ①

S. Ellióttii. Nearly smooth, 1°–4° high; leaves linear or lanceolate, serrate, short-petioled; flower 1′ broad, on a short peduncle; fruit of 10–12 nearly blunt carpels. Woodlands S. ♃

* *Peduncles bearing a corymb of several white flowers from the upper axils.*

S. Napæa. Smooth; stem simple, 4°–7° high; leaves rounded, 5-cleft, the lobes toothed and taper-pointed; corolla about 1′ broad; styles and cells of the pod 10. Wild in S. Penn. and Virg. Cult. in old gardens. ♃

10. ABÙTILON, INDIAN MALLOW. (Origin of name obscure.) Resembles Sida, but cells more than one-seeded; flowers usually larger.

A. Avicénnæ, VELVET-LEAF. Cult. soil and old gardens, 3°–5° high; leaves roundish heart-shaped, taper-pointed, soft-velvety; peduncles shorter than petiole, 1–3-flowered; corolla orange-yellow; fruit of 12–15 united hairy carpels with spreading beaks. Fl. autumn. ①

A. striàtum, STRIPED ABUTILON. Cult. in greenhouses, &c. from Brazil; a tall shrub, very smooth, with rounded heart-shaped 3-lobed leaves, the lobes very taper-pointed, and pretty large solitary flowers hanging on a very long and slender peduncle; corolla not spreading open, orange-colored, with deeper or brownish veining or stripes.

11. MODÌOLA. (The shape of the depressed fruit likened to the Roman measure *modiolus*.) Procumbent or spreading, small-flowered, weedy plants.

M. multífida. Virginia and S., in low grounds; leaves 3–7-cleft and cut, or the earlier ones rounded and undivided; flowers red, ½′ broad; fruit hairy at the top. ② ♃

12. MALVAVÍSCUS. (Name composed of *Malva*, Mallow, and *viscus*, birdlime, from the glutinous pulp of the berry-like fruit.) Shrubby plants, with showy scarlet flowers, of peculiar appearance, the petals not expanding, but remaining convolute around the lower part of the slender projecting and soon twisted column, held together as it were by a little side-lobe near the base of the inner edge.

M. arbòreus, the common West India species, cult. in some hot-houses, has heart-shaped leaves longer than broad, and yellowish fruit.

M. Drummóndii, of Texas, if housed in winter flowers all summer in open ground, is soft-downy, with more rounded and somewhat 3-lobed leaves, and scarlet fruit.

13. KOSTELÉTZSKYA. (Named for a Bohemian botanist, *Kosteletzsky*.) Like Hibiscus, only the cells of ovary and fruit 1-seeded. Fl. summer.

K. Virgínica, VIRGINIAN K. In and near salt marshes, from New York and New Jersey S.: roughish-hairy, 2°–5° high; leaves heart-shaped or mostly 3-lobed, often halberd-shaped; flowers somewhat racemed or panicled, rose-purple, 1′–2′ broad. ♃

14. HIBÍSCUS, ROSE-MALLOW. (Ancient name, of obscure origin.) Flowers showy, usually large, in summer and autumn.

* *Tall shrubs or even trees, exotics.*

H. Syriacus, TREE H. or SHRUBBY ALTHÆA, of gardens and grounds, common, native of the Levant: nearly smooth, with wedge-ovate and 3-lobed leaves, and short-peduncled flowers in their axils, in autumn, about 3′ broad, purple, rose-color, white, &c., often double.

H. Rosa-Sinénsis. CHINA H. or ROSE OF CHINA. Cult. in conservatories, from East Indies (where the splendid corollas, which stain black, are used to black shoes): very smooth, with bright green ovate and pointed somewhat toothed leaves, and very showy flowers on slender peduncles, 4′ or 5′ broad, scarlet-red (rarely rose-purple or even white), often double.

* * *Herbs, with persistent and regular 5-lobed calyx, and a short pod.*

+- *Wild species, but sometimes cultivated, tall and large.* ♃

H. coccíneus, GREAT RED H. or ROSE-MALLOW. Marshes from Carolina S.; very smooth, 4° – 7° high, with leaves 5-parted or deeply cleft into long lanceolate and taper-pointed divisions, and bright-red corolla 6′ – 11′ broad, the petals narrowed below.

H. militàris, HALBERD-LEAVED R. Low grounds from Pennsylvania and Illinois S.; smooth, 3° – 4° high, with ovate or heart-shaped toothed or 3-lobed leaves, some of them halberd-shaped, and slender-peduncled flowers, with inflated calyx, and flesh-colored corolla 4′ – 5′ broad.

H. Moscheùtos, SWAMP R. Common in brackish marshes and up the larger rivers; 3° – 7° high, soft-downy; the ovate pointed and often 3-lobed leaves hoary beneath, generally smooth above; peduncles slender; corolla 4′ – 6′ broad, pale rose or white, with or without a darker centre; pod smooth.

H. grandiflòrus, LARGE-FL. R. Swamps, from Illinois and Carolina S.; like the last, but leaves soft-downy both sides, and pod velvety-hairy.

H. aculeàtus, PRICKLY or ROUGH R. Swamps only S.; rough with stiff bristles and bristly points, 2° – 6° high; leaves 3 – 5-cleft and the divisions mostly toothed; flowers short-peduncled; leaves of the involucre often forked; corolla yellow with a purple centre, 4′ broad; pod bristly.

+- +- *Exotic low species, in gardens or cultivated grounds.* ①

H. Triònum, BLADDER KETMIA or FLOWER-OF-AN-HOUR. Rather hairy, 1° – 2° high, with the leaves toothed, or the upper 3-parted into lanceolate lobes, the middle lobe much longest; calyx inflated and bladdery; corolla about 2′ broad, sulphur-yellow with a blackish eye, open only in midday sunshine.

* * * *Herbs, with calyx splitting down one side, and generally falling off at once, and with long or narrow pyramidal or angled pod: natives of East Indies.*

H. esculéntus, OKRA or GUMBO. Nearly smooth, with rounded heart-shaped 5-lobed toothed leaves, greenish-yellow flowers on slender peduncle (involucre falling early), and narrow pods 3′ or 4′ long, which are very mucilaginous, and when green cooked and eaten, or used to thicken soups: cult. S. ①

H. Mánihot. Smoothish, with leaves 5 – 7-parted into long narrow divisions; the large and showy corolla pale yellow with a dark eye; the leaves of the involucre hairy and soon falling off: introduced or cult. S. W. ♃

15. GOSSÝPIUM, COTTON. (Name given by Pliny, from the Arabic.) Plants now diffused over warm countries, most valuable for the wool on the seeds: the species much mixed up.

G. herbàceum, COMMON COTTON. Cult. S. Leaves with 5 short and roundish lobes; petals pale yellow or turning rose-color, purple at base. ①

G. Barbadénse, BARBADOES OR SEA-ISLAND C. Cult. on the coast S. Inclining to be shrubby at base; branches black-dotted; leaves with 5 longer lance-ovate and taper-pointed lobes; leaves of the involucre with very long and slender teeth; petals yellowish or whitish with purple base.

G. arbòreum, TREE C. Cult. S., only for curiosity, has 5 – 7 nearly lanceolate and taper-pointed lobes to the leaves, leaves of involucre slightly toothed, and a purple corolla with a darker centre.

23. STERCULIACEÆ, STERCULIA FAMILY.

Chiefly a tropical family, to which belongs the THEOBROMA or CHOCOLATE-TREE; in common cultivation known here only by a single species of

1. **MAHÉRNIA.** (Name an anagram of *Hermannia*, a genus very like it.) Calyx, corolla, &c. as in the Mallow Family; but the stamens only 5, one before each petal; the filaments monadelphous only at the base and enlarged about the middle, and the anthers with 2 parallel cells. The edges of the base of the petals rolled inwards, making a hollow claw. Ovary 5-celled, with several ovules in each cell: styles 5, united at the base.

M. verticillàta. Cult. from Cape of Good Hope, in conservatories producing a succession of honey-yellow sweet-scented small blossoms, on slender peduncles, all winter and spring; a sort of woody perennial, with slender and spreading or hanging roughish branches and small green irregularly pinnatifid leaves; the specific name given because the leaves seem to be whorled; but this is because the stipules, which are cut into several linear divisions, imitate leaves.

24. TILIACEÆ, LINDEN FAMILY.

Chiefly a tropical family, represented here only by an herbaceous CORCHORUS on our southernmost borders, and by the genus of fine trees which gives the name.

1. **TÍLIA,** LINDEN, LIME-TREE, BASSWOOD. (The old Latin name.) Sepals 5, valvate in the bud, as in the Mallow Family, but deciduous. Petals 5, imbricated in the bud, spatulate-oblong. Stamens numerous; their filaments cohering in 5 clusters, sometimes with a petal-like body in each cluster; anthers 2-celled. Pistil with a 5-celled ovary, having 2 ovules in each cell, in fruit becoming a rather woody globular 1–2-seeded little nut. Style 1: stigma 5-toothed. Embryo with a slender radicle and leaf-like lobed cotyledons folded up in the albumen. Trees with mucilaginous shoots, fibrous inner bark (*bast*), soft white wood, alternate roundish and serrate leaves more or less heart-shaped and commonly oblique at the base, deciduous stipules, and a cyme of small, dull cream-colored, honey-bearing flowers, borne in early summer on a nodding axillary peduncle which is united to a long and narrow leaf-like bract.

* *A petal-like scale before each petal, to the base of which the stamens are joined.*

T. Americàna, AMERICAN LINDEN or COMMON BASSWOOD. A handsome and large forest-tree, with leaves of rather firm texture and smooth or smoothish both sides, or in one variety thinner and more downy but not white beneath.

T. heterophýlla, WHITE LINDEN. Along the Alleghany region from Penn. and Kentucky S.; has larger leaves silvery white with a fine down underneath.

* * *No scales with the stamens. Natives of Europe.*

T. Europæa, EUROPEAN L., embraces both the SMALL-LEAVED variety, which is commonly planted about cities, and the LARGE-LEAVED or DUTCH L., with leaves as large and firm as those of our wild Basswood.

25. CAMELLIACEÆ, CAMELLIA or TEA FAMILY.

Trees or shrubs, with alternate and simple feather-veined leaves, and no stipules; the flowers large and showy, mostly axillary, regular, with both sepals and petals imbricated in the bud; the very numerous stamens with filaments more or less united at the base with each other and with the base of the corolla: anthers 2-celled: ovary and thick or woody pod 5-celled, with one or more seeds in

each cell. The petals themselves are commonly more or less united at their base; they are 5 or sometimes 6 or even more in number in natural flowers, and in cultivated plants apt to be increased by doubling.

* *Exotics, from China, Japan, &c.: some of the inner stamens entirely separate: commonly there is a gradation from bracts to sepals and petals.*

1. CAMELLIA. Numerous separate inner stamens within the ring or cup formed by the united bases of the very numerous outer stamens. Style 3-5-cleft. Seeds large, usually single in each cell of the thick and woody pod. Leaves evergreen, serrate.
2. THEA. Separate interior stamens only as many as the petals (5 or 6): otherwise nearly like Camellia: flowers less showy; bracts under the calyx inconspicuous.

* * *Natives of Southeastern States: stamens all united at the base.*

3. GORDONIA. Stamens in 5 clusters, one attached to the base of each petal. Style columnar: stigma 5-rayed. Seeds several, more or less winged. Leaves coriaceous or thickish.
4. STUARTIA. Stamens uniformly united by a short ring at the base of the filaments. Seeds 2 in each cell, wingless. Leaves thin and deciduous.

1. CAMÉLLIA. (Named for *G. Camellus* or *Kamel*, a missionary to China in the 17th century.)

C. Japónica, JAPAN CAMELLIA, with oval or oblong pointed and shining leaves, and terminal or nearly terminal flowers, simple or double, red, white, or variegated, of very many varieties, is the well-known and only common species; fl. through the winter, hardy only S.

2. THÈA, TEA-PLANT. (The Chinese name.) Genus too slightly different from Camellia. Shrubs, natives of China and Japan, sparingly cult. for ornament.

T. víridis, GREEN or COMMON T. Leaves oblong or broadly lanceolate, much longer than wide; the white flowers (1′ or more broad) nodding on short stalks in their axils.

T. Bohèa, BOHEA T. Leaves smaller and broader in proportion; probably a mere variety of the other.

3. GORDÒNIA. (Named for *Dr. Gordon* and another Scotchman of the same name.)

G. Lasiánthus, LOBLOLLY BAY. A handsome shrub or small tree, in swamps near the coast from Virginia S., with evergreen and smooth lance-oblong leaves tapering to the base and minutely serrate, and showy white flowers 2′-3′ across, in spring and summer, on a slender peduncle; the stamens short, on a 5-lobed cup.

G. pubéscens, also called FRANKLÍNIA, after *Dr. Franklin*. Grows only in Georgia and Florida; a tall, ornamental shrub or small tree, with thinner and deciduous leaves whitish downy beneath, as are the sepals and (white) petals, and longer style and filaments, the latter in 5 distinct parcels one on the base of each petal.

4. STUÁRTIA. (Named for *John Stuart*, the *Lord Bute* at the time of the American Revolution.) Ornamental shrubs, with thin leaves and handsome white flowers 2′ or 3′ across, in late spring or early summer, wild in shady woods of Southern States.

S. Virgínica, grows in the low country from Virginia S.; shrub 8°-12° high, with finely serrate leaves soft-downy underneath, pure white petals, purple stamens, one style, and a roundish pod.

S. pentágyna, belongs to the mountains S. of Virginia, and in cult. is hardy N.; has smoother leaves and rather larger very handsome flowers, their petals jagged-edged and tinged with cream-color, the sepals often reddish outside, 5 separate styles, and a 5-angled pointed pod.

26. LINACEÆ, FLAX FAMILY.

A small family, represented here only by the main genus,

1. **LINUM,** FLAX. (The classical Greek and Latin name.) Flowers (see Lessons, p. 89, fig. 174, 175, and p. 93, fig. 191) usually opening for only one day, and in sunshine, regular and symmetrical; the persistent sepals, deciduous petals, slightly monadelphous stamens, and mostly the styles 5, but the latter are sometimes fewer, occasionally partly united: ovary and pod with as many 2-seeded cells as there are styles, or mostly twice as many and one-seeded, each cell being divided more or less by a false partition. Seeds with a mucilaginous coat and a large straight oily embryo. Leaves simple, nearly sessile, and entire. Fl. all summer.

* *Wild species, annuals or scarcely perennials, with small yellow flowers.*

L. Virginiànum, the commonest WILD FLAX, in dry woods, 2° high, with spreading or recurving terete branches at the summit of the stem; the leaves oblong or lanceolate, only the lower spatulate and opposite; flowers scattered; styles separate; pod little larger than a pin's head.

L. striàtum, also common, mostly in boggy grounds, like the first; but has the branches shorter, scattered along the stem, and sharply 4-angled with intermediate grooves (whence the name); most of the stem-leaves opposite and oblong; flowers more crowded.

L. sulcàtum, much less common, in dry soil, also has grooved (upright) branches, but the leaves are linear and scattered; flowers and pods twice as large; sepals sharp-pointed, 3-nerved and with rough glandular margins; styles united half-way up.

* * *Cultivated, hardy, herbaceous, with 5 styles and largish handsome flowers.*

L. usitatíssimum, COMMON FLAX. Cult. from Old World, and inclined to run wild in fields; with narrow lanceolate leaves, corymbose rich blue flowers, and pointed sepals. ①

L. perénne, PERENNIAL FLAX. Cult. from Eu. in some varieties, for ornament, wild beyond the Mississippi; less tall than the foregoing, narrower-leaved; sepals blunt; petals sky-blue, sometimes pale, at least towards the base. ♃

L. grandiflòrum, LARGE-FL. RED FLAX. Cult. as an annual, from North Africa; 1° high, with linear or lanceolate leaves, and showy crimson-red flowers. ① ♃

* * * *Cultivated in conservatories, shrubby, with 3 styles and large flowers.*

L. trígynum, of India, has rather large elliptical leaves, and a succession of large and showy bright-yellow flowers.

27. GERANIACEÆ, GERANIUM FAMILY.

As now received a large and multifarious order, not to be characterized as a whole in any short and easy way, including as it does Geraniums, Nasturtiums, Wood-Sorrels, Balsams, &c., which have to be separately described.

§ 1. *Flowers regular and symmetrical: sepals persistent. Herbs.*

1. OXALIS. Sepals and petals 5, the former imbricated, the latter convolute in the bud. Stamens 10, monadelphous at base, the alternate ones shorter. Styles 5, separate on a 5-celled ovary, which becomes a membranaceous several-seeded pod. Juice sour and watery. Leaves commonly of three obcordate or two-lobed leaflets, which droop at nightfall. Flowers usually open only in sunshine.

2. LIMNANTHES. Sepals and petals 5, the former valvate, the latter convolute in the bud. Glands on the receptacle 5. Stamens 10, separate at the base. Style 1, five-lobed at the apex, rising from the centre of a deeply five-lobed ovary, which in fruit becomes 5 separate thickish and wrinkled akenes. Leaves pinnate; the leaflets cut or cleft.

3. FLŒRKEA. Sepals, small petals, stigmas, and lobes of the ovary 3; and stamens 6: otherwise like Limnanthes.
4. GERANIUM. Sepals and petals 5, the former imbricated, the latter commonly convolute in the bud. Glands on the receptacle 5, alternate with the petals. Stamens 10, monadelphous at the base, the alternate filaments shorter, but usually bearing anthers. Style 5-cleft. Ovary 5-celled, 5-lobed, the lobes separating when ripe into 5 two-ovuled but one-seeded carpels or little pods, which remain hanging by their long naked recurving styles as these split off, from below upwards, from a long central beak or axis. (Lessons, p. 125, fig. 277, 278.) Leaves with stipules. Herbage scented.
5. ERODIUM. Stamens with anthers only 5. Styles when they split off from the beak bearded inside, often twisting spirally: otherwise as Geranium.

§ 2. *Flowers somewhat irregular, Geranium-like. Shrubby or fleshy-stemmed.*

6. PELARGONIUM. Sepals and petals 5; the base of one sepal extends downward on one side the pedicel forming a narrow tube or adherent spur, and the two petals on that side of the flower differ from the rest more or less in size or shape. Stamens with anthers fewer than 10, commonly 7. Pistil, &c. as in Geranium. Herbage scented. Leaves with stipules.

§ 3. *Flowers very irregular, spurred, also unsymmetrical. Tender herbs.*

7. TROPÆOLUM. Sepals 5, united at the base, and in the upper side of the flower extended into a long descending spur. Petals 5, or sometimes fewer, usually with claws: the two upper more or less different from the others and inserted at the mouth of the spur. Stamens 8, unequal or dissimilar; filaments usually turned downwards and curving. Ovary of 3 lobes surrounding the base of a single style, in fruit becoming 3 thick and fleshy closed separate carpels, each containing a single large seed. Herbs, climbing by their long leafstalks; the watery juice with the pungent odor and taste of Cress. Leaves alternate: stipules none or minute. Peduncles axillary, one-flowered.
8. IMPATIENS. Sepals and petals similarly colored, the parts belonging to each not readily distinguished. There are 3 small outer pieces, plainly sepals, on one side of the flower; then, on the other side, a large hanging sac contracted at the bottom into a spur or little tail; within are two small unequally 2-lobed petals, one each side of the sac. Stamens 5, short, conniving or lightly cohering around and covering the 5-celled ovary, which in fruit becomes a several-seeded pod: this bursts elastically, flying in pieces at the touch, scattering the seeds, separating into 5 twisting valves and a thickish axis. Style none. Seeds rather large. Erect, branching, succulent-stemmed herbs, with simple leaves and no stipules.

1. ÓXALIS, WOOD-SORREL. (Name from Greek words meaning *sour-salt*, from the oxalates or "salt-of-sorrel" contained in the juice.)

* *Native species, flowering through the summer: leaflets broadly obcordate.*

O. stricta, YELLOW W. Extremely common in waste or cultivated soil and open woodlands; stems 3′ – 12′ high, leafy; slender peduncles bearing an umbel of 2 – 6 small yellow flowers, followed by slender pods. ① ♃

O. Acetosélla, TRUE W. Common in mossy woods N.; the leafstalks and 1-flowered scapes 2′ – 4′ high from a creeping scaly-toothed rootstock; flower rather large, white with delicate reddish veins. ♃

O. violàcea, VIOLET W. Common S., rarer N., in rocky or sandy soil; leafstalks and slender scape from a scaly bulb, the flowers several in an umbel, middle-sized, violet. ♃

* * *Cultivated in conservatories, from Cape of Good Hope.*

O. Bówiei, a stemless species, with a small bulb on a spindle-shaped root; leafstalks and few-flowered scapes 6′ – 10′ high; broad obcordate leaflets almost 2′ long; petals deep rose-color, 1′ long.

O. speciòsa is more hairy; leaflets obovate and scarcely notched, commonly crimson underneath, only 1′ long; scapes short, 1-flowered; petals 1½′ long, pink-red with a yellowish base.

O. flàva, from a strong bulb sends up to the surface a short scaly stem, bearing thick flattish leafstalks and short 1-flowered scapes; the leaflets 6 – 10 and linear; petals nearly 1′ long, yellow, often edged with reddish.

O. versicolor, the commoner and prettiest species, from small bulbs sends up slender stems, 2′ – 3′ high, bearing at summit leaves of 3 almost linear leaflets notched at the end, and slender 1-flowered peduncles; petals 1′ long, white or tinged with rose, with bright pink-red margins underneath, so that the blossom is red when rolled up in the bud or closed in shade, but white above when it opens in sunshine.

* * * *Cultivated from South America for the edible tubers.*

O. crenàta, the OCA of Peru, rather common in France, bears abundance of potato-like tubers as large as pullet's-eggs; stem leafy, 2° high; leaflets obcordate; peduncles several-flowered; petals yellow, rather large, crenate or several-notched at the end.

2. LIMNÁNTHES. (Name from Greek words for *marsh flower:* but in fact the plant flourishes in merely moist soil.) ①

L. Douglásii. Cult. for ornament from California; a low and spreading, mostly smooth, and slightly succulent garden annual, with leaves of 5 – 7 oblong or lanceolate and often 3 – 5-cleft leaflets, and rather neat flowers (in summer), solitary on slender axillary peduncles; the petals white with a yellow base, wedge-oblong, notched at the end, twice the length of the calyx, about ½′ long.

3. FLŒRKEA, FALSE MERMAID. (Named for *Flœrke*, a German botanist.) ①

F. proserpinacoìdes, in marshes and wet alluvial soil; a small and insignificant plant, with the 3 – 5 leaflets lanceolate and entire, or rarely 2 – 3-cleft; the axillary and peduncled flower inconspicuous (in spring and summer), the oblong petals shorter than the calyx and entire.

4. GERÀNIUM, CRANESBILL. (From old Greek name for the *Crane*, alluding probably to the long beak in fruit.) The following are wild species of the country: the so-called Geraniums of cultivation belong to Pelargonium. Sepals usually slender-pointed. Fl. spring and summer.

G. maculàtum, WILD or SPOTTED CRANESBILL. Common in woodlands and open grounds; stem erect from a stout root or rootstock, about 2° high, hairy, branching and terminating in long peduncles bearing a pair of flowers; leaves palmately parted into 5 – 7 wedge-shaped divisions cut and cleft at the end, sometimes whitish-blotched; petals wedge-obovate, light purple, ½′ long, bearded on the short claw. ♃

G. Caroliniànum, CAROLINA C. In open and mostly barren soil; stems erect or soon diffusely branched from the base, only 6′ – 18′ high; leaves palmately parted into 5 much cleft and cut divisions; peduncles and pedicels short; flowers barely half as large as in the foregoing, the pale rose-colored petals notched at the end. ① ②

G. Robertiànum, HERB ROBERT. Common N. in shady rocky places; very strong-scented, loosely hairy, diffusely spreading; leaves finely cut, being divided into 3 twice-pinnatifid divisions; flowers small; petals pink or red purple. ②

5. ERÒDIUM, STORKSBILL. (From Greek name for a *Heron*.)

E. cicutàrium, COMMON S. Nat. from Eu., in sterile soil, but not common, except in Texas and California, where it greatly abounds; low, hairy and rather viscid; the leaves mostly from the root, pinnate, and the leaflets finely once or twice pinnatifid; peduncle bearing an umbel of several small pinkish flowers, in summer. ① ②

6. PELARGÒNIUM, the GERANIUM, so-called, of house and summer-garden culture. (Name from Greek word for the *Stork*, from the beak of the fruit, which is like that of Geranium.) All are perennials, and most of the common ones more or less shrubby, natives of the Cape of Good Hope; in cultivation so mixed up by crossing that students will hardly be able to make out the species. The following are the types or originals of the commonest sorts.

§ 1. *Leaves peltate and fleshy, the 5 lobes entire: stems trailing.*

P. peltàtum, IVY-LEAVED P. Generally smooth, the leaf fixed towards the middle, with or without a darkish zone; flowers pink or varying to white.

§ 2. *Leaves round and crenate, very obscurely many-lobed and with a deep narrow sinus: petals all of one color (scarlet, pink, or varying to white), the two upper a little narrower than the others: stems erect, shrubby and succulent. The two species greatly mixed.*

P. zonàle, HORSE-SHOE P. So called from the dark horse-shoe mark or zone, which however is not always present; smoothish; petals narrowish.

P. inquinans, STAINING or SCARLET P. In the unmixed state is soft-downy and clammy, the leaves without the zone; petals broadly obovate, originally intense scarlet.

§ 3. *Leaves rounded, moderately if at all lobed: branches scarcely succulent: petals never scarlet, the two upper more or less larger than the three lower.*

* *Leaves sweet-scented, velvety or soft-downy: flowers small: stems or branches herbaceous or half herbaceous, spreading or straggling.*

P. capitàtum, ROSE-SCENTED P. Softly hairy, with the rose-scented leaves moderately lobed, the lobes short and broad; peduncle bearing many sessile flowers in a head; petals rose-purple, barely ½′ long.

P. tomentòsum, PEPPERMINT P. Densely soft-hairy; branches long and thickish; leaves rather large, round-heart-shaped and with 5 – 7 open lobes, velvety-hairy both sides; flowers on long pedicels in panicled umbels, insignificant; petals white, the 3 lower a little longer than the calyx.

P. odoratissimum, NUTMEG-SCENTED P. Branches slender and straggling, from a very short scaly stem or base; leaves rounded and crenate, soft-velvety, small; flowers on short pedicels, very small; petals white, scarcely exceeding the calyx.

* * *Leaves not sweet-scented: flowers large, pink, purple, white, &c., the two upper petals longer and broader than the three lower and streaked or spotted: shrubby and erect. (All much mixed.)*

P. cucullàtum, COWLED P. Soft-hairy, the rounded kidney-shaped leaves cupped, soft-downy.

P. cordàtum, HEART-LEAVED P. Like the last or less hairy, with flat ovate-heart-shaped leaves.

P. angulòsum, MAPLE-LEAVED P. Harsher-hairy; the leaves rigid, inclined to be lobed, truncate or even wedge-shaped at the base (scarcely ever heart-shaped), sharply toothed.

§ 4. *Leaves decidedly lobed or cut, in some species compound or decompound,*

* *Smooth and pale or glaucous, rounded, palmately 5 – 7-cleft.*

P. grandiflòrum, GREAT-FLOWERED P. Shrubby; peduncles bearing about 3 large flowers, with white petals 1½′ long, the two upper larger and elegantly veined or variegated with pink or rose-color.

* * *Silky-hoary, pinnately veined and somewhat pinnatifid.*

P. tricolor, THREE-COLORED P. Low, rather shrubby; the long-petioled small leaves lance-oblong; peduncles bearing 2 or 3 showy flowers; the three lower petals white, the two upper crimson, with a dark spot at their base, and rather smaller, ½′ long: not common.

* * * *Soft-hoary or velvety, palmately 3-parted, small: no obvious stipules.*

P. exstipulàtum, PENNY-ROYAL P. Low, rather shrubby; leaves with the sweet scent of Penny-Royal or Bergamot, ½′ wide, the lobes wedge-shaped and cut-toothed; flowers small and insignificant, white.

* * * * *Hairy, roughish, or downy: leaves more or less pinnatifid or pinnately compound or the main lobes or divisions pinnatifid, balsamic or strong-scented: stipules present.*

P. quercifòlium, OAK-LEAVED P. Shrubby, hairy and glandular; leaves deeply sinuate-pinnatifid, with wavy-toothed blunt lobes (the lowest

ones largest, making a triangular-heart-shaped outline), often dark-colored along the middle, unpleasantly scented; petals purple or pink, the two upper (1′ long) much longest.

P. gravèolens, HEAVY-SCENTED P. Shrubby and hairy like the last; leaves palmately 5 – 7-lobed or parted and the oblong lobes sinuate-pinnatifid; petals shorter.

P. Râdula, ROUGH P. Shrubby, rough and hairy above with short bristles; the balsamic or mint-scented leaves palmately parted and the divisions pinnately parted or again cut into narrow linear lobes, with revolute margins; peduncles short, bearing few small flowers; petals rose-color striped or veined with pink or purple.

P. fúlgidum, BRILLIANT P. Shrubby and succulent-stemmed, downy; leaves mostly 3-parted, with the lateral divisions wedge-shaped and 3-lobed, the middle one oblong and cut-pinnatifid; calyx broad in the throat; petals obovate, scarlet, often with dark lines, ½′ long.

P. tríste, SAD or NIGHT-SCENTED P. Stem succulent and very short from a tuberous rootstock, or none; leaves pinnately decompound, hairy; petals dull brownish-yellow with darker spots, sweet-scented at night.

7. TROPÆOLUM, NASTURTIUM or INDIAN CRESS. (Name from a Greek word for *a trophy*, the foliage of the common sort likened to a group of shields.) Cult. from South America, chiefly Peru, for ornament, and the pickled fruits used as a substitute for capers, having a similar flavor and pungency: fl. all summer, showy.

T. màjus, COMMON N. Climbing high, also low and scarcely climbing; leaves roundish and about 6-angled, peltate towards the middle; petals much longer than calyx, varying from orange to scarlet and crimson, pointless, entire or a little jagged at the end, and the 3 lower and longer-clawed ones fringed at the base: also a full double variety. ①

T. mìnus, SMALLER N. Smaller; petals paler yellow and with a pointed tip. Now less common than the preceding, but mixed with it. ①

T. tuberòsum, TUBEROUS N. Less common; leaves with 5 rather deep lobes; petals entire, orange, scarcely longer than the heavy-spurred orange-red calyx; tubers edible. ♃

T. peregrìnum, CANARY-BIRD FLOWER. Climbing high; leaves deeply 5 – 7-lobed and cut; spur hooked or curved; petals light yellow, the 2 upper lobed, the 3 lower small and fringed. ①

8. IMPÀTIENS, TOUCH-ME-NOT, JEWEL-WEED, BALSAM. (Name from the sudden bursting of the pod when touched.) Ours are all tender and succulent-stemmed annuals: fl. all summer.

I. pállida, PALE T. Wet ground and moist shady places, commonest N., 1° – 4° high, branched; leaves alternate, oval; flowers panicled, pale yellow dotted with brownish-red (rarely spotless), the sac broader than long and tipped with a short incurved spur.

I. fúlva, SPOTTED T. Commoner S.; has smaller orange-colored flowers spotted with reddish-brown, sac longer than broad and tapering into an inflexed spur (spots and spur rarely wanting).

I. Balsámina, GARDEN BALSAM, from India. Low, with crowded lanceolate leaves, the lower opposite, a cluster of large and showy short-spurred flowers in their axils, on short stalks, of very various shades (from white to red and purple); the finer sorts full double.

28. RUTACEÆ, RUE FAMILY.

Known by the transparent dots or glands (resembling punctures) in the simple or compound leaves, containing a pungent or acrid bitter-aromatic volatile oil; and stamens only as many or twice as many (or in Orange and Lemon more numerous), inserted on the base of a receptacle (or a glandular disk surrounding it) which

sometimes elevates more or less the single compound pistil or the 2 – 5 more or less separate carpels. Leaves either opposite or alternate, in ours mostly alternate, without stipules. Flowers only in No. 2 irregular. Many species are medicinal.

§ 1. *Perennial, strong-scented, hardy (exotic) herbs: flowers perfect: stamens 8 or 10: ovary 4 – 5-lobed, 4 – 5-celled: seeds several.*

1. RUTA. Sepals and petals 4 or 5, short, the latter roundish and arching. Stamens twice as many as the petals. Style 1. Pod globular and many-seeded. Leaves decompound.
2. DICTAMNUS. Sepals and petals 5; the latter long and lanceolate, on short claws, the lower one declining, the others ascending. Stamens 10; the long filaments declining and curved, partly glandular. Styles 5, nearly separate. Ovary a little elevated, deeply 5-lobed, in fruit becoming 5 flattened rough-glandular 2 – 3-seeded pods, each splitting when ripe into 2 valves, which divide into an outer and an inner layer. Leaves pinnate.

§ 2. *Shrubs or trees, hardy, with polygamous, diœcious, or sometimes perfect, small (greenish or whitish) flowers: stamens 4 or 5, as many as the petals: seeds single or in pairs.*

* *Indigenous: leaves pinnate or of 3 leaflets, deciduous.*

3. ZANTHOXYLUM. Flowers diœcious. Pistils 2 – 5; their styles slightly cohering; the ovaries separate, ripening into rather fleshy at length dry and 2-valved little pods. Seed black, smooth and shining. Prickly trees or shrubs: leaves pinnate.
4. PTELEA. Flowers polygamous. Pistil a 2-celled ovary tipped with a short style, forming a 2-celled 2-seeded and rounded wing-fruit or samara, in shape like that of the Elm. Not prickly: leaflets 3.

* * *Exotic: leaves simple and entire, evergreen.*

5. SKIMMIA. Flowers polygamous or perfect. Ovary 2 – 5-celled, with a single ovule from the top of each cell, in fruit becoming a red berry or drupe.

§ 3. *Shrubs or trees, exotic, not hardy, with sweet-scented foliage and perfect flowers, having numerous (20 – 60) stamens.*

6. CITRUS Petals 4 – 8, usually 5, thickish. Filaments irregularly united more or less. Ovary many-celled, encircled at the base by a conspicuous disk (see Lessons, p. 125, fig. 281), in fruit becoming a thick-rinded many-seeded large berry. Branches usually spiny. Leaves evergreen, apparently simple, but with a joint between the blade and the (commonly winged or margined) petiole, showing that the leaf is a compound one reduced to the end-leaflet.

1. RÙTA, RUE. (The ancient name.) Natives of the Old World. ♃

R. gravèolens, Common Rue. Cult. in country gardens; a bushy herb, woody or almost shrubby at the base, with bluish-green and strongly dotted oblong or obovate small leaflets, the terminal one broader and notched at the end, and corymbs of greenish-yellow flowers, produced all summer; the earliest blossom has the parts in fives, the rest in fours. Plant very acrid, sometimes even blistering the skin.

2. DICTÁMNUS, FRAXINELLA. (Ancient Greek name.) Native of Southern Europe. ♃

D. Fraxinélla. Cult. for ornament; herb with an almost woody base, viscid-glandular, and with a strong aromatic scent; the leaves likened to those of Ash on a smaller scale (whence the common name) of 9 – 13 ovate and serrate leaflets; the large flowers in a terminal raceme, in summer, in one variety pale purple with redder veins, another white.

3. ZANTHÓXYLUM, PRICKLY ASH. (Name composed of two Greek words, meaning *yellow wood.*) Bark, leaves, and little fleshy pods very pungent and aromatic.

Z. Americànum, Northern P. or Toothache-tree. Rocky woods and banks N.; a prickly shrub or small tree, with leaves downy when young, of 9 – 11 ovate or oblong leaflets; the greenish flowers in axillary clusters, in

spring, preceding the leaves, either the sepals or petals wanting; pistils 3–5 with slender styles; the little pods about the size and shape of pepper-corns, lemon-scented, raised from the receptacle on thickish stalks.

Z. Caroliniànum, SOUTHERN P. Sandy coast S.; a small tree, the bark armed with warty and the leafstalks with very slender prickles, smooth, with 7–9 ovate or lance-ovate leaflets, and whitish flowers in a terminal cyme, in early summer, later than the leaves, with the petals and sepals both present, 3 or 2 short-styled pistils, and pods not stalked.

4. PTÈLEA, HOP-TREE. (The ancient Greek name for the Elm, from the resemblance in the winged fruit.)

P. trifoliàta, THREE-LEAVED H. Rocky woods from Penn. S. & W.; a tall shrub or small tree, with ovate pointed leaflets, and a terminal cyme of small greenish-white unpleasantly scented flowers, in early summer; the orbicular winged fruit bitter, used as a substitute for hops.

5. SKÍMMIA. (*Skimmi* is the name in Japan, from which country the common species was recently introduced into ornamental cultivation.)

S. Japónica, a low quite hardy shrub, smooth, with oblong and entire bright-green evergreen leaves crowded on the end of the branches, which in spring are terminated with close panicle or cluster of small and white sweet-scented flowers, of no beauty, but followed by bright red berries which last over winter.

6. CÍTRUS, CITRON, ORANGE, &c. (Ancient name for *Citron.*) Natives of India, &c., cultivated with us only for ornament. Flowers white, very sweet-scented, rather showy. The species or varieties are much confused or mixed.

C. vulgàris, BITTER ORANGE, with broadly winged petiole; fruit with a thin roughish rind and acrid bitter pulp.

C. Aurántium, SWEET ORANGE, with a very narrow wing or slight margin to the petiole; fruit globose, with a smooth and thin separable rind and a sweet pulp.

Var. **myrtifòlia,** MYRTLE-LEAVED or CHINESE ORANGE, dwarf, with small leaves (1′–1½′ long) and small fruit, depressed or sunken at the apex.

C. Limònium, LEMON, with a narrow wing or margin to the petiole, oblong and acute toothed leaves, petals commonly purplish outside, and fruit ovoid-oblong, with adherent rind and a very acid pulp.

C. Limétta, LIME, with wingless petiole, roundish or oval serrate leaves, and globular fruit with a firm rind and sweetish pulp.

C. Médica, CITRON (named from the country, *Media*), with wingless petiole, oblong or oval acute leaves, petals purplish outside, and a large oblong sweet-scented fruit with a very thick roughish adherent rind, and slightly acid pulp.

29. SIMARUBACEÆ, QUASSIA FAMILY.

May be regarded as Rutaceæ without transparent dots in the leaves; here represented by a single tree, the

1. AILÁNTHUS, CHINESE SUMACH or TREE-OF-HEAVEN. (*Ailanto*, a native name.) Flowers polygamous, small, greenish, in terminal branched panicles, with 5 short sepals and 5 petals, 10 stamens in the sterile flowers and few or none in the fertile; the latter with 2 to 5 ovaries (their styles lateral, united or soon separate), which in fruit become linear-oblong thin and membranaceous veiny samaras or keys, like those of Ash on a smaller scale, but 1-seeded in the middle.

A. glandulòsus, the only species known here, from China, is a common shade-tree, tall, of rapid growth, with hard wood, very long pinnate leaves, and many obliquely lanceolate entire or sparingly sinnate leaflets; flowers in early summer, the staminate very ill-scented.

30. MELIACEÆ, MELIA FAMILY.

Trees, chiefly with pinnately compound dotless leaves, stamens twice as many as the petals and united up to or beyond the anthers into a tube, and a several-celled ovary with a single style; almost all tropical, — represented in Florida and farther south by SWIETÈNIA MAHOGANI, the MAHOGANY-TREE, and by an exotic shade-tree at the South, viz.

1. **MÈLIA.** (Old Greek name of the Ash, transferred to a widely different tree.) Calyx 5–6-parted. Petals 5 or 6, linear-spatulate. Filaments united into a cylindrical tube with a 10–12-cleft mouth, enclosing as many anthers. Fruit a globose berry-like drupe, with a bony 5-celled stone, and a single seed in each cell. Flowers in large compound panicles.

M. Azédarach, PRIDE-OF-INDIA or CHINA-TREE. A favorite shade-tree at the S., 30°–40° high, with twice pinnate smooth leaves, ovate and pointed toothed leaflets, of a deep green color, and numerous fragrant lilac-colored flowers, in spring, succeeded by the yellowish fruit.

31. ANACARDIACEÆ, CASHEW FAMILY.

Trees or shrubs, with resinous or acid, sometimes poisonous, often colored or milky juice; alternate leaves without stipules; small flowers with sepals, petals, and stamens 5; and a 1-celled 1-ovuled ovary bearing 3 styles or stigmas, — represented by the genus

1. **RHÚS,** SUMACH. (Ancient name.) Flowers polygamous or diœcious, sometimes perfect, whitish or greenish, in terminal or axillary panicles. Stamens inserted under the edge or between the lobes of a flattened disk in the bottom of the calyx. Fruit a small dry or berry-like drupe, the solitary seed on a curved stalk rising from the bottom of the cell. (The astringent leaves of some species are used for dyeing and tanning, those of R. CORIARIA in S. Europe for morocco leather. The juice of some Japanese species yield their famous lacquer; the fruit of another a sort of wax.)

§ 1. *Cultivated from Europe, with simple entire leaves: not poisonous.*

R. Cótinus, SMOKE-TREE or VENETIAN SUMACH. Shrub 5°–9° high, smooth, with obovate leaves on slender petioles, loose panicles of flowers in early summer, followed rarely by little half-heart-shaped fruits: usually most of the flowers are abortive, while their pedicels lengthen, branch, and bear long plumy hairs, making large and light, feathery or cloud-like bunches, either greenish or tinged with red, which are very ornamental. The same or one very like it is wild in Alabama.

§ 2. *Native species, with compound leaves of* 3–31 *leaflets.*

* *Poisonous to the touch for most people, the juice resinous: flowers in slender axillary panicles, in summer: fruit smooth, white or dun-color.*

R. Toxicodéndron, POISON IVY or POISON OAK. Common in low grounds, climbing by rootlets over rocks, &c., or ascending trees; leaflets 3, rhombic-ovate, often sinuate or cut-lobed, rather downy beneath. A vile pest.

R. venenàta, POISON SUMACH, P. ELDER, or P. DOGWOOD. In swampy ground; shrub 6°–18° high, smooth, with pinnate leaves of 7–13 obovate entire leaflets, and very slender panicles. More virulent than the foregoing.

* * *Not poisonous: fruit red and beset with reddish hairs, very acid.*

+ *Leaves pinnate: flowers whitish, in large and very compact terminal panicles. in early summer, succeeded by a compact mass of crimson fruit.*

R. týphina, STAGHORN SUMACH. Shrub or tree, on hillsides, &c., 10°–30° high, with resinous-milky juice, brownish-yellow wood, velvety-hairy

branches and stalks, and large leaves of 11 – 31 lance-oblong pointed and serrate leaflets. Worthy to be planted for ornament.

R. glàbra, Smooth S. Shrub 2° – 12° high, in rocky places, like the last, but smooth, the leaflets whitened beneath. — Var. laciniata, in Penn., has the leaflets cut into narrow irregular lobes: planted for ornament.

R. copallìna, Dwarf S. Shrub 1° – 5° high, in rocky or sandy ground, spreading by subterranean shoots; with downy stalks or branches, petioles winged or broadly margined between the 9 – 21 oblong or lance-ovate oblique leaflets, which are thickish and shining above; juice resinous.

+ + *Leaves of 3 cut-lobed leaflets: flowers light yellow, in spring before the leaves appear, diœcious, in small scaly-bracted and catkin-like spikes.*

R. aromática, Fragrant S. A straggling bush in rocky places, from Vermont W. & S., with the small rhombic-ovate leaflets pubescent when young, aromatic-scented.

32. VITACEÆ, VINE FAMILY.

Woody plants, climbing by tendrils, with watery and often acid juice, alternate leaves, deciduous stipules, and small greenish flowers in a cyme or thyrsus; with a minutely 4 – 5-toothed or almost obsolete calyx; petals valvate in the bud and very deciduous; the stamens as many as the petals and opposite them; a 2-celled ovary with a pair of ovules rising from the base of each cell, becoming a berry containing 1 – 4 bony seeds. Tendrils and flower-clusters opposite the leaves.

1. VITIS. Calyx very short, a fleshy disk connecting it with the base of the ovary and bearing the petals and stamens.
2. AMPELOPSIS. Calyx minutely 5-toothed: no disk. Petals expanding before they fall. Leaflets 5.

1. VÌTIS, GRAPE-VINE. (The classical Latin name.) Fl. in late spring.

§ 1. True Grapes. *Petals and stamens 5, the former lightly cohering at the top and thrown off without expanding: the base of the very short and truncate calyx filled with the disk, which rises into 5 thick lobes or glands between the stamens: leaves simple, rounded and heart-shaped, usually 3 – 5-lobed.*

* *Flowers all perfect, somewhat fragrant: exotic.*

V. vinífera, European Grape. Cult. from immemorial time, from the East, furnishing the principal grapes of our greenhouses, &c.; some varieties nearly hardy N.: leaves green, cottony only when very young.

* * *Flowers more or less polygamous (some plants inclined to produce only staminate flowers), exhaling a fragrance like that of Mignonette: native species.*

+ *Bark of stem early separating in loose strips: panicles compound and loose.*

V. Labrúsca, Northern Fox-Grape, the original of the Catawba, Isabella, and furnishing most of the American table and wine grapes; common in moist grounds N. & W.: leaves and young shoots very cottony, even the adult leaves retaining the cottony wool underneath, the lobes separated by roundish sinuses; fruit large, with a tough musky pulp when wild, dark purple or amber-color, in compact clusters.

V. æstivàlis, Summer Grape. Common N. & S.; leaves green above, and with loose cobwebby down underneath, the lobes with roundish open sinuses; clusters slender; fruit smaller and earlier than in the foregoing, black with a bloom, pleasant. Original of the Clinton Grape, &c.

V. cordifòlia, Winter or Frost Grape. Common on banks of streams: leaves never cottony, green both sides, thin, heart-shaped, little lobed, but coarsely and sharply toothed; clusters loose; fruit small, bluish or black with a bloom, very sour, ripe after frosts. Var. ripària, the common form along river-banks W. has broader and more cut or lobed leaves.

+- +- *Bark of stem close and smooth, pale.*

V. vulpina, MUSCADINE, BULLACE, or FOX-GRAPE of the South. River-banks from Maryland and Kentucky S.: leaves rather small, round in outline, seldom and slightly lobed, glossy and mostly smooth both sides, the margin cut into coarse and broad teeth; clusters small; fruit large, $\frac{1}{2}'-\frac{3}{4}'$ in diameter, purple, thick-skinned, musky, or pleasant-flavored, ripe in early autumn: the original of the SCUPPERNONG GRAPE, &c.

§ 2. CISSUS. *Petals and stamens 4 or 5, the former opening regularly: disk thick and broad, 4–5-lobed: flowers mostly perfect: berries not larger than peas, not eatable.*

* *Wild species S. & W., smooth, usually with 5 stamens and petals.*

V. indivisa, a species with simple leaves like those of a true Grape, heart-shaped or ovate, pointed, coarsely-toothed, but not lobed; flower-clusters small and loose; style slender.

V. bipinnàta, a bushy or low-climbing plant, with few tendrils, and decompound leaves, the small leaflets cut-toothed.

* * *Exotic species, with mostly 4 stamens and petals.*

V. heterophýlla, from Japan, a form with the leaves blotched or variegated with white (small, thin, variously 3–5-lobed), and small blue berries, is hardy in gardens; cult. for the variegated foliage.

V. díscolor, from Java, cult. in hothouses, for its splendid foliage; leaves lance-oblong with a heart-shaped base, crimson underneath, velvety-lustrous and dark-green shaded with purple or violet, or often mottled with white, on the upper surface, the shoots reddish.

2. AMPELÓPSIS, VIRGINIA-CREEPER. (Name from Greek words, meaning *like the Vine*: indeed, it is hardly distinct enough from the second section of *Vitis*.)

A. quinquefòlia, the only genuine species: in all low grounds, climbing extensively, sometimes by rootlets as well as by the tendrils, the latter specially fitted for ascending walls and trunks, to which they attach themselves firmly by sucker-like disks at the tip of their branches (Lessons, p. 38, figs. 62, 63); leaflets 5, digitate, lance-oblong, cut-toothed, changing to crimson in autumn; flowers cymose, in summer; berries small, black or bluish.

33. RHAMNACEÆ, BUCKTHORN FAMILY.

Shrubs or trees, of bitterish and astringent properties, with simple chiefly alternate leaves and small flowers; well marked by the stamens of the number of the valvate sepals (4 or 5) and alternate with them, i. e. opposite the petals, inserted on a disk which lines the calyx-tube and often unites it with the base of the ovary, this having a single erect ovule in each of the (2–5) cells. Branches often thorny: stipules minute or none: flowers often apetalous or polygamous. Petals commonly hooded or involute around the stamen before it. (Lessons, p. 126, fig. 282, 283.)

* *Calyx free from the ovary.*

1. BERCHEMIA. Twining climbers, with straight-veined leaves. Petals 5, without claws, rather longer than the stamens. Disk thick, nearly filling the bottom of the calyx. Ovary 2-celled, becoming a 2-celled small stone-fruit, with purple and thin pulp.
2. RHAMNUS. Erect shrubs or trees, with loosely-veined leaves. Petals 4 or 5, with short claws. Stamens short. Ovary 2–4-celled, becoming a black berry-like fruit, containing 2–4 cartilaginous seed-like nutlets, which are grooved on the back, as is the contained seed. Cotyledons foliaceous.
3. FRANGULA. Like Rhamnus, but with straight-veined leaves; the nutlets not grooved but convex on the back: cotyledons thick.

* * *Calyx with the disk coherent with the base of the ovary and fruit.*

4. CEANOTHUS. Erect or depressed shrubs or undershrubs. Petals 5, hood-shaped, spreading, their claws and the filaments slender. Ovary 3-celled, when ripe becoming a cartilaginous or crustaceous 3-seeded pod.

1. BERCHEMIA, SUPPLE-JACK. (Probably named for some botanist of the name of *Berchem.*)

B. volùbilis. Common in low grounds S., climbing high trees, smooth, with very tough and lithe stems (whence the popular name), small oblong-ovate and simply parallel-veined leaves, and greenish-white flowers in small panicles terminating the branchlets, in early summer.

2. RHÁMNUS, BUCKTHORN. (The ancient name.) Flowers greenish, axillary, mostly in small clusters, commonly polygamous or diœcious, in early summer. Berry-like fruit mawkish.

* *Flowers with petals, the parts in fours: leaves minutely serrate.*

R. cathárticus, COMMON BUCKTHORN. Cult. from Eu., for hedges, run wild in a few places; forms a small tree, with thorny branchlets, ovate or oblong leaves, and 3 – 4-seeded fruit.

R. lanceolàtus, NARROW-LEAVED B. Wild from Penn. S. & W.; shrub not thorny, with lanceolate or oblong leaves, and 2-seeded fruit.

* * *Flowers without petals: stamens and lobes of the calyx 5.*

R. alnifòlius, ALDER-LEAVED B. Wild in cold swamps N.; a low shrub, with oval acute serrate leaves, and 3-seeded berry-like fruit.

3. FRÁNGULA, ALDER-BUCKTHORN. (From *frango,* to break, the stems brittle.) Flowers greenish, generally perfect, and the parts in fives.

F. Caroliniàna. Wild in wet grounds, from New Jersey and Kentucky S.; a thornless shrub or low tree, with oblong and almost entire rather large leaves; flowers solitary or in small clusters in the axils, in early summer; the 3-seeded fruit black.

4. CEANÒTHUS. (An ancient name, of unknown meaning, applied to these N. American plants.) Flowers in little umbels or fascicles, usually clustered in dense bunches or panicles, handsome, the calyx and even the pedicels colored like the petals and stamens. Ours are low undershrubby plants, with white flowers. In and beyond the Rocky Mountains, especially in California, are many species, some of them tall shrubs or small trees, loaded with showy blossoms.

C. Americànus, NEW-JERSEY TEA or RED-ROOT. Wild in dry grounds, 1° – 2° high from a dark red root; leaves ovate or oblong ovate, finely serrate, downy beneath, 3-ribbed and veiny, deciduous (used as a substitute for tea in early times, the use lately revived); flowers crowded in a dense slender-peduncled cluster, in summer.

C. ovàlis. Wild on rocks N. from Vermont to Wisconsin: lower than the preceding and smoother, with smaller narrow-oval or lance-oblong leaves, and larger flowers on a shorter peduncle, in spring.

C. microphýllus, SMALL-LEAVED C. Dry barrens S.: low and spreading, much branched; leaves evergreen, very small, obovate, 3-ribbed; flower-clusters small and simple, in spring.

34. CELASTRACEÆ, STAFF-TREE FAMILY.

Shrubs, sometimes twining, with simple leaves, minute and deciduous stipules or none, and small flowers with sepals and petals both imbricated in the bud, and stamens of the number of the latter, alternate with them, and inserted on a disk which fills the bottom of the calyx and often covers the 2 – 5-celled few-ovuled ovary; the seeds usually furnished with or enclosed in a fleshy or pulpy aril.

Represented both as to native and cultivated plants by two genera:

1. CELASTRUS. Flowers polygamous or diœcious. Petals and stamens 5, on the edge of a concave disk which lines the bottom of the calyx. Filaments and style rather slender. Pod globular, berry-like, but dry. Leaves alternate.
2. EUONYMUS. Flowers perfect, flat; the calyx-lobes and petals (4 or 5) widely spreading. Stamens mostly with short filaments or almost sessile anthers, borne on the surface of a flat disk which more or less conceals or covers the ovary. Pod 3 – 5-lobed, generally bright-colored. Leaves opposite: branchlets 4-sided.

1. CELÁSTRUS, STAFF-TREE. (Old Greek name, of obscure meaning and application.)

C. scándens, CLIMBING BITTER-SWEET or WAX-WORK. A twining high-climbing shrub, smooth, with thin ovate-oblong and pointed finely serrate leaves, racemes of greenish-white flowers (in early summer) terminating the branches, the petals serrate or crenate-toothed, and orange-colored berry-like pods in autumn, which open and display the seeds enclosed in their scarlet pulpy aril: wild in low grounds, and planted for the showy fruit.

2. EUÓNYMUS, SPINDLE-TREE. (Old Greek name, means *of good repute.*) Shrubs not twining, with dull-colored inconspicuous flowers, in small cymes on axillary peduncles, produced in early summer; the pods in autumn ornamental, especially when they open and display the seeds enveloped in their scarlet pulpy aril.

* *Leaves deciduous, finely serrate: style short or nearly none.*

+ *North American species: anthers sessile or nearly so.*

E. atropurpùreus, BURNING-BUSH or SPINDLE-TREE. Tall shrub, wild from New York W. & S., and commonly planted; with oval or oblong petioled leaves, flowers with rounded dark dull-purple petals (generally 4), and smooth deeply 4-lobed red fruit, hanging on slender peduncles.

E. Americànus, AMERICAN STRAWBERRY-BUSH. Low shrub, wild from New York W. & S., and sometimes cult.; with thickish ovate or lance-ovate almost sessile leaves, usually 5 greenish-purple rounded petals, and rough-warty somewhat 3-lobed fruit, crimson when ripe. Var. OBOVÀTUS, with thinner and dull obovate or oblong leaves, has long and spreading or trailing and rooting branches.

+ + *Exotic: anthers raised on evident filaments.*

E. Europæus, EUROPEAN SPINDLE-TREE. Occasionally planted, but inferior to the foregoing; a rather low shrub, with lance-ovate or oblong short-petioled leaves, about 3-flowered peduncles, 4 greenish oblong petals, and a smooth 4-lobed red fruit, the aril orange-color.

* * *Leaves evergreen, serrulate: filaments and style rather slender.*

E. Japónicus, JAPAN S. Planted S. under the name of CHINESE BOX, there hardy, but is a greenhouse plant N.; has obovate shining and bright green leaves (also a form with white or yellowish variegation), several-flowered peduncles, 4 obovate whitish petals, and smooth globular pods.

35. SAPINDACEÆ, SOAPBERRY FAMILY.

Trees, shrubs, or one or two herbaceous climbers, mostly with compound or lobed leaves, and unsymmetrical flowers, the stamens sometimes twice as many as the petals or lobes of the calyx, but commonly rather fewer, when of equal number alternate with the petals; these imbricated in the bud, inserted on a disk in the bottom of the calyx and often coherent with it: ovary 2 – 3-celled, sometimes 2 – 3-lobed, with 1 – 3 (or in Staphylea several) ovules in each cell. The common plants belong to the three following suborders.

I. BLADDER-NUT FAMILY; has perfect and regular flowers, stamens as many as the petals, several bony seeds with a straight embryo in scanty albumen, and opposite compound leaves both stipulate and stipellate.

1. STAPHYLEA. Erect sepals, petals, and stamens 5; the latter borne on the margin of a fleshy disk which lines the bottom of the calyx. Styles 3, slender, separate or lightly cohering: ovary strongly 3-lobed, in fruit becoming a bladdery 3-lobed 3-celled and several-seeded large pod. Shrubs, with pinnately compound leaves of 3 or 5 leaflets.

II. SOAPBERRY FAMILY PROPER; has flowers often polygamous or diœcious, and more or less irregular or unsymmetrical, only 1 or 2 ovules, ripening but a single seed in each cell of the ovary, the embryo coiled or curved, without albumen. No stipules.

* *Leaves alternate. Pod bladdery-inflated, except in No. 4.*

2. CARDIOSPERMUM. Herbs, with twice ternate and cut-toothed leaves, climbing by hook-like tendrils in the flower-clusters. Sepals 4, the inner pair larger. Petals 4, each with an appendage on the inner face, that of the two upper large and petal-like, of the two lower crest-like and with a deflexed spur or process, raised on a claw. Disk irregular, enlarged into two glands, one before each lower petal. Stamens 8, turned towards the upper side of the flower away from the glands, the filaments next to them shorter. Styles or stigmas 3, short: ovary triangular, 3-celled, with a single ovule rising from the middle of each cell. Fruit a large and thin bladdery 3-lobed pod: seeds bony, globose, with a scale-like heart-shaped aril adherent to the base.
3. KŒLREUTERIA. Small tree, with pinnate leaves. Sepals 5. Petals 3 or 4 (the place of the others vacant), each with a small 2-parted scale-like appendage attached to its claw. Disk enlarging into a lobe before each petal. Stamens 5 - 8, declined: filaments hairy. Style single, slender: ovary triangular, 3-celled, with a pair of ovules in each cell. Pod bladdery, 3-lobed, 3-celled.
4. SAPINDUS. Trees, with abruptly pinnate leaves. Sepals and petals each 5, or rarely 4; the latter commonly with a little scale or appendage adhering to the short claw. Stamens mostly 8, equal. Style single: ovary 3-lobed, 3-celled, with a single ovule in each cell. Fruit mostly a globular and fleshy 1-celled berry (the other cells abortive), filled with a large globular seed, its coat crustaceous: cotyledons thick and fleshy.

* * *Leaves opposite, of 5 - 9 digitate leaflets. Pod leathery, not inflated.*

5. ÆSCULUS. Trees or shrubs. Calyx 5-lobed or 5-toothed. Petals 4 or 5, more or less unequal, on claws enclosed in the calyx, not appendaged. Stamens 7, rarely 6 or 8: filaments slender, often unequal. Style single, as also the minute stigma: ovary 3-celled, with a pair of ovules in each cell. Fruit a leathery pod, splitting at maturity into 3 valves, ripening 1 - 3 very large, chestnut-like, hard-coated seeds: the kernel of these consists of the very thick cotyledons firmly joined together, and a small incurved radicle.

III. MAPLE FAMILY; has flowers generally polygamous or diœcious, and sometimes apetalous, a mostly 2-lobed and 2-celled ovary, with a pair of ovules in each cell, ripening a single seed in each cell of the winged fruit. Embryo with long and thin cotyledons, coiled or crumpled. (See Lessons, p. 5, fig. 1 - 3, &c.) Leaves opposite: no stipules.

6. ACER. Trees, or a few only shrubs, with palmately-lobed or even parted leaves. Calyx mostly 5-cleft. Petals as many or none, and stamens 3 - 8 or rarely more, borne on the edge of the disk. Styles or stigmas 2, slender. Fruit a pair of samaras or key-fruits, united at the base or inner face and winged from the back. Occasionally the ovary is 3-celled and the fruit 3-winged.
7. NEGUNDO. Trees, with pinnate leaves of 3 - 7 leaflets, and diœcious very small flowers, without petals or disk; the calyx minute: stamens 4 or 5. Fruit, &c. of Acer.

1. STAPHYLÈA, BLADDER-NUT. (Name from a Greek word for a bunch of grapes, little applicable.)

S. trifòlia, AMERICAN B. Shrub 8° – 10° high, with greenish striped branches, 3 ovate pointed serrate leaflets, deciduous stipules, and hanging raceme-like clusters of white flowers at the end of the branchlets of the season, in spring, followed by the large bladdery pods. Low ground, common N. & W.

S. pinnàta, EUROPEAN B., occasionally planted, is very similar, but has five leaflets.

2. CARDIOSPÉRMUM, BALLOON-VINE, HEART-SEED. (The latter is a translation of the Greek name.)

C. Halicácabum, the common species, wild in the S. W. States, is cult. in gardens, for the curious inflated pods; it is a delicate herb, climbing over low plants or spreading on the ground, with small white flowers, in summer.

3. KŒLREUTÈRIA. (Named for *Kœlreuter*, a German botanist.)

K. paniculàta, a small tree from China, planted in ornamental grounds; has pinnate leaves of numerous thin and coarsely toothed or cut leaflets, and a terminal ample branched panicle of small yellow flowers, in summer, followed by the bladdery pods.

4. SAPÍNDUS, SOAPBERRY. (*Sapo Indus*, i. e. Indian soap, the berries used as a substitute for soap.)

S. marginàtus, Wild S. & W.: a small tree, with 8 – 20 broadly lanceolate falcate leaflets on a wingless but often margined common stalk, and small white flowers in panicles, in summer, the whitish berries as large as bullets.

5. ÆSCULUS, HORSE-CHESTNUT, BUCKEYE. (Ancient name of an Oak or other mast-bearing tree, applied to these trees on account of their large chestnut-like seeds. These, although loaded with farinaceous nourishment, are usually rendered uneatable, and even poisonous, by a bitter narcotic principle.) Flowers in a terminal crowded panicle, in late spring or early summer.

§ 1. TRUE HORSE-CHESTNUTS: *natives of Asia, with broad and spreading petals on short claws, and fruit more or less beset with prickly points.*

Æ. Hippocástanum, COMMON H. Tall fine tree, with 7 leaflets, and large flowers of 5 petals, white, and spotted with some purple and yellowish; stamens 7, declined: of late there is a double-flowered variety.

Æ. rubicúnda, RED H. Less tall, flowering even as a shrub, with brighter green leaves of 5 – 7 leaflets, flowers with 4 rose-red petals not so spreading, and mostly 8 stamens less declined. Probably a hybrid between Horse-Chestnut and some red Buckeye.

§ 2. *Californian, with 4 broad spreading petals on rather slender claws.*

Æ. Califórnica, CALIFORNIAN H. Low tree, of 5 slender-stalked leaflets, and a long very compact raceme-like panicle of small white or rosy-tinged flowers; stamens 5 – 7, slender; fruit large, with some rough points.

§ 3. BUCKEYES: *of Atlantic U. S., with 4 erect and smaller petals on slender claws.*

Æ. parviflòra, SMALL BUCKEYE. Wild in the upper country S., and planted N.; shrub 3° – 9° high, with 5 – 7 leaflets soft downy underneath, slender raceme-like panicle 1° long, and capillary stamens very much longer than the narrow white petals; flowering N. as late as midsummer; fruit smooth; seeds small, almost eatable.

Æ. glàbra, FETID or OHIO BUCKEYE. W. of the Alleghanies; tall tree, with 5 nearly smooth leaflets, a short panicle, stamens moderately longer than the somewhat uniform pale yellow petals, and fruit prickly roughened like that of Horse-Chestnut.

Æ. flàva, YELLOW or SWEET BUCKEYE. W. & S.; tree or shrub, with 5 – 7 smooth or smoothish leaflets, a short dense panicle, oblong calyx, and

stamens not exceeding the connivent light yellow petals, these of two dissimilar pairs, the longer pair with very small blade; fruit smooth.

Var. **purpuráscens,** PURPLISH B., has both calyx and corolla tinged with purple or reddish, and leaflets generally downy underneath.

Æ. Pàvia, RED BUCKEYE. S. & W.; shrub or low tree, like the last, but leaves generally smooth; the longer and tubular calyx and the petals bright red: showy in cultivation.

6. **ÀCER,** MAPLE. (The classical Latin name.) Mostly fine trees.

* *Flowers in late spring or early summer, appearing more or less later than the leaves, in usually drooping racemes or corymbs, commonly terminating a 2–4-leaved shoot of the season, greenish or yellowish, with petals: stamens more than 5, generally 8.*

+ EUROPEAN MAPLES, *planted for ornament and shade.*

A. Pseudo-Plátanus, SYCAMORE M. A fine tree, with spreading branches, ample 5-lobed leaves whitish and rather downy beneath, on long reddish petioles, the lobes toothed, long racemes, and moderately spreading wings to the pubescent fruit.

A. platanoìdes, NORWAY M., here so called. A handsome, round-headed tree, with thin and broad smooth leaves, bright green both sides, their 5 short lobes set with 2–5 coarse and taper-pointed teeth, a small corymb of flowers, and flat smooth fruit with wings 2′ long, diverging in a straight line. Juice milky: leaves holding green later than the others.

+ + OREGON and CALIFORNIAN MAPLES, *beginning to be planted East.*

A. circinàtum, ROUND-LEAVED or VINE M. Tall, spreading shrub with thin and rounded moderately 7–9-lobed leaves, their lobes serrate, small corymbs of purplish flowers, and wings of fruit diverging in a straight line.

A. macrophýllum, LARGE-LEAVED M. Small timber-tree, with thickish leaves 6′–12′ across and deeply 5–7-lobed, the lobes with one or two sinuate lobes or coarse teeth, many yellowish flowers in a compact raceme, and hairy fruit with ascending wings.

+ + + NATIVE STRIPED and MOUNTAIN MAPLES.

A. spicàtum, MOUNTAIN M. Tall shrub, common N., with slightly 3-lobed and coarsely toothed leaves downy beneath, and upright dense racemes of small flowers, followed by small fruits with diverging narrow wings. The latest-flowering species.

A. Pennsylvánicum, STRIPED M., also called MOOSE-WOOD and STRIPED DOGWOOD. Small tree, common N., with light-green bark striped with darker lines, large thin leaves finely sharply serrate all round, and at the end with 3 short and very taper-pointed lobes, slender hanging racemes of rather large green flowers, and fruit with diverging wings.

* * SUGAR MAPLES. *Flowers appearing with the leaves in spring, in umbel-like clusters, on long drooping pedicels, greenish-yellow, without petals: stamens 7 or 8.*

A. sacchárinum, ROCK or SUGAR M. Large tree, common especially N., valuable for timber and for the sugar of its sap; with rather deeply 3–5-lobed leaves pale or whitish beneath, the sinuses open and rounded, and the lobes with one or two sinuate coarse teeth; calyx bell-shaped and hairy-fringed; wings of fruit ascending, barely 1′ long.

Var. **nìgrum,** BLACK SUGAR M., a form with leaves green or greener and more or less downy beneath, even when old, the sinus at the base apt to be deep and narrow.

* * * SOFT MAPLES. *Flowers in earliest spring, much preceding the leaves, in umbel-like clusters from separate lateral buds: pedicels at first short, the fruiting ones lengthening and drooping: stamens 3–6: fruit ripe and falling in early summer.*

A. dasycárpum, WHITE or SILVER M. A handsome tree in low grounds, with long and spreading or drooping branches, soft white wood, very

deeply 5-lobed leaves silvery-white and when young downy beneath, the narrow lobes coarsely cut and toothed; flowers greenish, in earliest spring, without petals; fruit woolly when young, but soon smooth, 2′ – 3′ long including the great diverging wings.

A. rùbrum, RED or SWAMP M. Rather small tree, in wet grounds, with soft white wood, reddish twigs, moderately 3 – 5-lobed leaves whitish beneath, the middle lobe longest, all irregularly serrate; flowers scarlet, crimson, or sometimes yellowish (later than in the foregoing species); fruit smooth, with the slightly spreading wings 1′ or less in length, often reddish.

7. NEGÚNDO, ASH-LEAVED MAPLE, BOX-ELDER. (Obscure or unmeaning name.)

N. aceroìdes. A handsome, rather small tree, common from Penn. S. & W., with light green twigs, and drooping clusters of small greenish flowers, in spring, rather earlier than the leaves, the fertile ones in drooping racemes, the oblong fruits half the length of the very veiny wing; leaflets ovate, pointed, coarsely toothed, very veiny. A variety with white-variegated leaves is lately cult. for ornament.

36. POLYGALACEÆ, POLYGALA FAMILY.

Bitter, some of them medicinal plants, represented mainly, and here wholly, by the genus

1. POLÝGALA, MILKWORT. (Name from Greek words, meaning *much milk*; but the plants have no milky juice at all; they are thought to have been so named from a notion that in pasturage they increased the milk of cows.) Flowers remarkably irregular, in outward appearance as if papilionaceous like those of the next family, but really of a quite different structure. Calyx persistent, of 5 sepals; three of them small, viz. two on the lower, and one on the upper, side of the blossom; and one on each side called *wings* which are larger, colored, and would be taken for petals. Within these, on the lower side, are three petals united into one, the middle one keel-shaped and often bearing a crest or appendage. Stamens 8 or sometimes 6; their filaments united below into a split sheath, separating above usually in two equal sets, concealed in the hooded middle petal: anthers 1-celled, opening by a hole at the top. Style curved and commonly enlarged above or variously irregular. Ovary 2-celled, with a single ovule hanging from the top of each cell, becoming a small flattish 2-seeded pod. Seed with an appendage at the attachment (*caruncle*): embryo straight, with flat cotyledons in a little albumen. Leaves simple, entire, without stipules. Our native species are numerous, mostly with small or even minute flowers, and are rather difficult to study. The following are the commonest.

§ 1. *Native species, low herbs, mostly smooth.*

* *Flowers yellow, some turning green in drying, in dense spikes or heads: leaves alternate. Growing in low or wet places in pine-barrens, S. E. Fl. summer.*

+ *Numerous short spikes or heads in a corymb.*

P. cymòsa. Stem 1° – 3° high, branching at top into a compound corymb of spikes; leaves linear, acute, the uppermost small; no caruncle to the seed. From North Carolina S.

P. ramòsa. Stem 6′ – 12′ high, more branched; lowest leaves obovate or spatulate, upper ones lanceolate; a caruncle at base of seed. Delaware and S.

+ + *Short and thick spike or head single: root-leaves clustered.*

P. lùtea, YELLOW BACHELOR'S-BUTTON of S. Stem 5′ – 12′ high; lower leaves spatulate or obovate, upper lanceolate; flowers bright orange.

P. nàna. Stems 2′ – 4′ high, in a cluster from the spatulate or linear root-leaves; flowers lighter yellow.

* * *Flowers purple or rose-color, in a single dense spike terminating the stem or branches: no subterranean flowers. Fl. all summer.* ①

+ *Leaves all alternate, narrow.*

P. incarnàta. From Penn. W. & S.; stem slender, 6′–12′ high; leaves minute and awl-shaped; the three united petals extended below into a long and slender tube, the crest of the middle one conspicuous.

P. sanguínea. Sandy damp ground: stem 4′–8′ high, leafy to the top; leaves oblong-linear; flowers bright rose-purple (sometimes pale or even white), in a thick globular at length oblong head or spike, without pedicels.

P. fastigiàta. Pine-barrens from New Jersey S.; slender, 4′–10′ high, with smaller narrow-linear leaves, and oblong dense spike of smaller rose-purple flowers, on pedicels as long as the pod; bracts falling off.

P. Nuttállii. Sandy soil, from coast of Mass. S.; lower than the foregoing; flowers rather looser in more cylindrical spikes, greenish-purple; awl-shaped bracts remaining on the axis after the flowers or fruits have fallen.

+ + *Leaves all or all the lower ones in whorls of four.*

P. cruciàta. Low grounds: stems 3′–10′ high, 4-angled, and with spreading branches; leaves linear or spatulate, mostly in fours; spike thick and short, nearly sessile, its axis rough with persistent bracts where the flowers have fallen; wings of the flower broad-ovate or heart-shaped, bristly-pointed.

P. brevifòlia. Sandy bogs from Rhode Island S.: differs from the last only in more slender stems, narrower leaves, those on the branches alternate, the spike stalked, and wings of the flower lance-ovate and nearly pointless.

* * * *Flowers (all summer) greenish-white or scarcely tinged with purple, very small, in slender spikes, none subterranean: leaves linear, the lower in whorls of four or five.* ①

P. verticillàta. Very common in dry sterile soil; stem 5′–10′ high, much branched; all the leaves of the main stem whorled.

P. ambígua. In similar places and very like the last, chiefly S. & W., more slender; only the lowest leaves whorled; flowers more scattered and often purplish-tinged, in long-peduncled spikes.

* * * * *Flowers white, small (in late spring) in a close spike terminating simple tufted stems which rise from a perennial root, none subterranean: leaves numerous, all alternate.* ♃

P. Sénega, SENECA SNAKEROOT. A medicinal plant, commoner W., 5′–12′ high, with lanceolate or oblong, or even lance-ovate short leaves, cylindrical spike, round-obovate wings, and small crest.

P. álba. Common only far W. & S. W.; more slender than the last, with narrow-linear leaves, more tapering long-peduncled spike, and oval wings.

* * * * * *Flowers rose-purple in a raceme, or single, largish: leaves alternate.*

P. grandiflòra. Dry soil S.; pubescent, with branching stems 1° high, lanceolate leaves, crestless flowers scattered in a loose raceme (in late summer), bright purple turning greenish. ♃

P. polýgama. Sandy barrens, with tufted and very leafy stems 5′–8′ high, linear-oblong or oblanceolate leaves, and many-flowered racemes of handsome rose-purple flowers, their crest conspicuous; also on short underground runners are some whitish very fertile flowers with no evident corolla. Fl. all summer. ②

P. paucifòlia, FRINGED POLYGALA, sometimes called FLOWERING WINTERGREEN. Light soil in woods, chiefly N.: a delicate little plant, with stems 3′–4′ high, rising from long and slender runners or subterranean shoots, on which are concealed inconspicuous fertile flowers; leaves few and crowded at the summit, ovate, petioled, some of them with a slender-peduncled showy flower from the axil, of delicate rose-red color (rarely a white variety), almost an inch long, with a conspicuous fringed crest and only 6 stamens; in spring. ♃

§ 2. *Shrubby species of the conservatory, from the Cape of Good Hope.*

P. oppositifòlia, with opposite sessile heart-shaped and mucronate leaves, of a pale hue, and large and showy purple flowers, with a tufted crest.

P. myrtifòlia, has crowded alternate oblong or obovate leaves, on short petioles, and showy purple flowers 1′ long, with a tufted crest.

37. LEGUMINOSÆ, PULSE FAMILY.

Distinguished by the *papilionaceous* corolla (Lessons, p. 105, fig. 217, 218), usually accompanied by 10 monadelphous or diadelphous or rarely distinct stamens (Lessons, p. 112, fig. 227, 228), and the *legume* (Lessons, p. 131, fig. 303, 304). These characters are combined in the proper Pulse Family. In the two other great divisions the corolla becomes less papilionaceous or wholly regular. Alternate leaves, chiefly compound, entire leaflets, and stipules are almost universal in this great order.

I. PULSE FAMILY PROPER. Flower (always on the plan of 5, and stamens not exceeding 10) truly papilionaceous, i. e. the standard outside of and in the bud enwrapping the other petals, or only the standard present in Amorpha. (For the terms used to denote the parts of this sort of corolla see Lessons, p. 105.) Sepals united more or less into a tube or cup. Leaves never twice compound.

A. *Stamens monadelphous or diadelphous.*

§ 1. *Herbs, shrubs, or one a small tree, never twining, trailing, nor tendril-bearing, with leaves simple or of 3 or more digitate leaflets, monadelphous stamens, and the alternate five anthers differing in size and shape from the other five: pod usually several-seeded.*

1. LUPINUS. Leaves of several leaflets, in one species simple: stipules adherent to the base of the petiole. Flowers in a long thick raceme. Calyx deeply 2-lipped. Corolla of peculiar shape, the sides of the rounded standard being rolled backwards, and the wings lightly cohering over and enclosing the narrow and incurved scythe-shaped or sickle-shaped keel. Pod flat. Mostly herbs.
2. CROTALARIA. Leaves in our species simple, and with foliaceous stipules free from the petiole but running down on the stem. Calyx 5-lobed. Keel scythe-shaped, pointed. Stamens with the tube of filaments split down on the upper side. Pod inflated. Ours herbs.
3. GENISTA. Leaves simple and entire: stipules very minute or none. Calyx 5-cleft. Keel oblong, nearly straight, blunt, turned down when the flower opens. Pod mostly flat. Low shrubby plants.
4. CYTISUS. Leaves of one or three leaflets, or the green branches sometimes leafless: stipules minute or wanting. Calyx 2-lipped or 5-toothed. Keel straight or somewhat curved, blunt, soon turned down. Style incurved or even coiled up after the flower opens. Pod flat. Seeds with a fleshy or scale-like appendage (*strophiole*) at the scar. Low shrubby plants.
5. LABURNUM. Leaves of three leaflets: stipules inconspicuous or wanting. Calyx with 2 short lips, the upper lip notched. Keel incurved, not pointed. Ovary and flat pod somewhat stalked in the calyx. Seeds naked at the scar. Trees or shrubs, with golden yellow flowers in long hanging racemes.

§ 2. *Herbs, never twining nor tendril-bearing, with leaves of 3 leaflets (rarely more but then digitate), their margins commonly more or less toothed (which is remarkable in this family): stipules conspicuous and united with the base of the petiole* (Lessons, p. 69, fig. 136): *stamens diadelphous: pod 1–few-seeded, never divided across into joints.*

* *Leaves pinnately 3-foliolate, as is seen by the end leaflet being jointed with the common petiole above the side leaflets.*

6. TRIGONELLA. Herbage odorous. Flowers (in the common cult. species) single and nearly sessile in the axil of the leaves. Pod elongated, oblong or linear, tapering into a long-pointed apex.
7. MEDICAGO. Flowers small, in spikes, heads, &c. Corolla short, not united with the tube of stamens. Pod curved or coiled up, at least kidney-shaped.
8. MELILOTUS. Herbage sweet-scented. Flowers small, in slender racemes. Corolla as in Medicago. Pod small, but exceeding the calyx, globular, wrinkled, closed, 1–2-seeded.

* * *Leaves mostly digitate or palmately 3-foliolate, all (with one exception) borne directly on the apex of the common petiole.*

9. TRIFOLIUM. Flowers in heads, spikes, or head-like umbels. Calyx with slender or bristle-form teeth or lobes. Corolla slowly withering or becoming dry and permanent after flowering; the claws of all the petals (except sometimes the standard) more or less united below with the tube of stamens or also with each other. Pod small and thin single - few-seeded, generally included in the calyx or the persistent corolla.

§ 3. *Herbs or woody plants, sometimes twining, never tendril bearing, with the leaves not digitate, or even digitately 3-foliolate (except in* Psoralea), *and the leaflets not toothed.* (*For* Cicer *see the next section.*) *Stipules except in No.* 15, 20, and 27, *not united with the petiole.*

* *Flowers (small, in spikes or heads) indistinctly or imperfectly papilionaceous. Pod very small and usually remaining closed, only 1 - 2-seeded. Calyx 5-toothed, persistent. Leaves odd-pinnate, mostly dotted with dark spots or glands.*

+ *Petals* 5, *on very slender claws: stamens monadelphous in a split tube.*

10. PETALOSTEMON. Herbs, with crowded leaves. Four petals similar, spreading, borne on the top of the tube of the stamens; the fifth (answering to the standard) rising from the bottom of the calyx, and heart-shaped or oblong. Stamens only 5.

11. DALEA. Herbs, as to our species. Flowers as in the last, but rather more papilionaceous, four of the petals borne on the middle of the tube of 10 stamens.

+ + *Petal only one! Stamens monadelphous only at the very base.*

12. AMORPHA. Shrubs, with leaves of many leaflets. Standard (the other petals wholly wanting) wrapped around the 10 filaments and style. Flowers violet or purple, in single or clustered terminal spikes.

* * *Flowers (large and showy, in racemes) incompletely papilionaceous from the wings or the keel also being small and inconspicuous. Pod several-seeded.*

30. ERYTHRINA. See p. 108.

* * * *Flowers obviously papilionaceous, all the parts conspicuously present. Stamens mostly diadelphous.*

+ *Ovary 1-ovuled, becoming a 1-seeded indehiscent akene-like fruit. Herbs.*

13. PSORALEA. Leaves of 3 or 5 leaflets, often glandular-dotted. Flowers (never yellow) in spikes or racemes, often 2 or 3 under each bract. Pod ovate, thick, included or partly so in the 5-cleft persistent calyx, often wrinkled.

14. ONOBRYCHIS. Leaves odd-pinnate, of numerous leaflets. Flowers racemed, rose-purple. Pod flattish, wrinkled and spiny-roughened or crested.

15. STYLOSANTHES. Leaves pinnately 3-foliolate. Flowers yellow, in heads or short spikes, leafy-bracted. Calyx with a slender stalk-like tube, and 4 lobes in the upper lip, one for the lower. Stamens monadelphous: 5 longer anthers fixed by their base, 5 alternate ones by their middle. Pod flat, reticulated, sometimes raised on a stalk-like empty lower joint. Stipules united with the petiole.

16. LESPEDEZA. Leaves pinnately 3-foliolate. Stipules small and free, or falling early. Flowers purple, rose-color, or white, in spikes, clusters, or panicles, or scattered. Stamens diadelphous: anthers uniform. Pod flat and thin, ovate or orbicular, reticulated, sometimes raised on a stalk-like empty lower joint.

+ + *Ovary with at least 2 ovules.*

++ *Pod separating into 2 or more small and closed 1-seeded joints in a row.*

17. DESMODIUM. Leaflets 3 (rarely only 1), stipellate. Pod of very flat joints (Lessons, p. 131, fig. 304), usually roughish and adhesive by minute hooked pubescence. Herbs, with small purple, whitish, or purplish flowers, in racemes, which are often panicled.

18. ÆSCHYNOMENE. Leaflets several, odd-pinnate, small. Pod of very flat joints. Herbs, with small yellow flowers (sometimes purplish externally), few or several on axillary peduncles.

19. CORONILLA. Leaflets several, odd-pinnate, small. Pod of thickish oblong or linear joints. Herbs or shrubs, with flowers in head-like umbels raised on slender axillary peduncles.

+- +- *Pod indehiscent, very thick, 1–3-seeded. Calyx with a long, thread-shaped or stalk-like tube. Leaves abruptly pinnate: stipules united with the petiole at base.*

20. ARACHIS. Annual. Leaflets 4, straight-veined. Flowers small, yellow, in axillary heads or spikes. Calyx with one narrow lobe making a lower lip, *the upper lip broad and 4-toothed. Keel incurved and pointed.* Stamens monadelphous, 5 anthers longer and fixed by near their base, the alternate ones short and fixed by their middle. Ovary at the bottom of the very long and stalk-like tube of the calyx, containing 2 or 3 ovules: when the long style and the calyx with the rest of the flower falls away, the forming pod is protruded on a rigid deflexed stalk which then appears, and is pushed into the soil where it ripens into the oblong, reticulated, thick, coriaceous fruit, which contains the 1–3 large and edible seeds; the embryo composed of a pair of very thick and fleshy cotyledons and an extremely short nearly straight radicle.

+- +- +- *Pod continuous, i. e. not in joints, at length opening, 2–several-seeded.*

a. *Leaves abruptly pinnate: plants not twining. (Flowers in ours yellow.)*

21. SESBANIA. Herbs, with many pairs of leaflets, and minute or early deciduous stipules. Flowers in axillary racemes, or sometimes solitary. Calyx short, 5-toothed. Standard rounded, spreading: keel and style incurved. Pod usually intercepted internally with cellular matter or membrane between the seeds.

22. CARAGANA. Shrubs, with mostly fascicled leaves of several pairs of leaflets, and a little spiny tip in place of an end leaflet: stipules minute or spiny. *Flowers solitary or 2–3 together on short peduncles. Calyx bell-shaped or* short-tubular, 5-toothed. Standard nearly erect with the sides turned back: the blunt keel and the style nearly straight. Pod linear, several-seeded.

b. *Leaves odd-pinnate: stems not twining.*

1. *Anthers tipped with a little gland or blunt point.*

23. INDIGOFERA. Herbs, or sometimes shrubby, when pubescent the close-pressed hairs are fixed by the middle. Flowers rose-color, purple, or white, in axillary racemes or spikes, mostly small. Calyx 5-cleft. Standard roundish, often persistent after the rest of the petals have fallen: keel with a projection or spur on each side. Pod oblong, linear, or of various shapes, commonly with membranous partitions between the seeds.

2. *Anthers blunt and pointless.*

24. TEPHROSIA. Herbs, with obliquely parallel-veined leaflets often silky beneath, and white or purple flowers (2 or more in a cluster) in racemes; the peduncles terminal or opposite the leaves Calyx 5-cleft or 5-toothed. Standard rounded, silky outside. Style incurved, *rigid:* stigma with a tuft of hairs. Pod linear, flat, several-seeded.

25. ROBINIA. Trees or shrubs, with netted-veined leaflets furnished with stipels, and often with sharp spines or prickles for stipules. Flowers large and showy, white or rose-color, in axillary racemes. Base of the leafstalk hollow and covering the axillary bud of the next year. Calyx 5-toothed, the two upper teeth partly united. Standard large, turned back: keel incurved, blunt. Ovary stalked in the calyx. Pod broadly linear, flat, several-seeded, margined on the seed-bearing edge, the valves thin.

26. COLUTEA. Shrubs, *not prickly, and no stipels to the* leaflets: the flowers rather large, yellow or reddish, in short axillary racemes. Calyx 5-toothed. Standard rounded, spreading: keel strongly incurved, blunt, on long united claws. Style incurved, bearded down one side. Pod raised out of the calyx on a stalk of its own, thin and bladdery-inflated, flattish on the seed-bearing side, several-seeded.

27. ASTRAGALUS. Herbs, without stipels, and with white, purple, or yellowish rather small flowers in spikes, heads, or racemes: peduncles axillary. Corolla narrow: standard erect, mostly oblong. Style and stigma smooth and beardless. Pod commonly *turgid or inflated and within more or less divided* lengthwise by intrusion of the back or a false partition from it.

(SWAINSONA, SUTHERLANDIA, and CLIANTHUS, plants from Australia, New Zealand, and South Africa, with showy flowers and bladdery-inflated pods (like Colutea), are sometimes cult. in conservatories, but are not common enough to find a place here.)

c. *Leaves odd-pinnate: stems twining: stipels obscure: stipules small.*

28. WISTARIA. Woody, high-climbing, with numerous leaflets, and large showy bluish flowers, in hanging terminal dense racemes. Calyx with 2 short teeth on the upper and longer ones on the lower side. Standard large, roundish, turned back: keel merely incurved, blunt. Pod knobby, several-seeded.

29. APIOS. Herbs, twining over bushes, with 5–7 leaflets, and sweet-scented chocolate-purple flowers, in dense and short racemes: peduncles axillary. Calyx with 2 upper very short teeth, and one longer lower one, the side teeth nearly wanting. Standard very broad, turned back: keel long and scythe-shaped, strongly incurved, or at length coiled. Pod linear, flat, almost straight, several-seeded.

d. *Leaves of 3 leaflets (pinnately 3-foliolate) or rarely one, commonly stipellate.*

1. *Shrubby, or from a woody base: wings and sometimes keel small and inconspicuous.*

30. ERYTHRINA. Stem, branches, and even the leafstalks usually prickly. Flowers large and showy, usually red, in racemes. Calyx without teeth. Standard elongated: wings often wanting or so small as to be concealed in the calyx; keel much shorter than the standard, sometimes very small. Pod stalked in the calyx, linear, knobby, usually opening only down the seed-bearing suture. Seeds scarlet.

2. *Herbs, mostly twiners, with wings and keel in ordinary proportion.*

= *Flowers not yellow: seeds or at least the ovules several: leaflets stipellate.*

31. PHASEOLUS. Keel of the corolla coiling into a ring or spiral, usually with a tapering blunt apex: standard rounded, turned back or spreading. Style coiled with the keel, bearded down the inner side: stigma oblique or lateral. Pod linear or scimetar-shaped. Flowers usually clustered on the knotty joints of the raceme. Stipules striate, persistent.

32. DOLICHOS. Keel of the corolla narrow and bent inwards at a right angle, but not coiling. Style bearded under the terminal stigma. Stipules small. Otherwise nearly as Phaseolus.

33. GALACTIA. Keel straightish, blunt, as long as the wings: standard turned back. Style naked. Calyx of 4 pointed lobes, upper one broadest. Pod flattened, mostly linear. Flowers clustered on the knotty joints of the raceme: flower-buds taper-pointed. Stipules and bracts small or deciduous.

34. AMPHICARPÆA. Keel and very similar wings nearly straight, blunt: the erect standard partly folded around them. Style naked. Calyx tubular, 4-toothed. Flowers small; those in loose racemes above often sterile, their pods when formed scimetar-shaped and few-seeded; those at or near the ground or on creeping branches very small and without manifest corolla, but very fertile, making small and fleshy, obovate or pear-shaped, mostly subterranean pods, ripening one or two large seeds. Bracts rounded and persistent, striate, as are the stipules.

35. CENTROSEMA. Keel broad, incurved, nearly equalling the wings: standard large and rounded, spreading, and with a spur-like projection behind. Calyx short, 5-cleft. Style bearded only at the tip around the stigma. Pod long, linear, with thickened edges bordered by a raised line on each side. Flowers showy. Stipules, bracts, and bractlets striate, persistent.

36. CLITORIA. Keel small, shorter than the wings, incurved, acute: standard much larger than the rest of the flower, notched at the end, erect. Calyx tubular, 5-toothed. Style bearded down the inner side. Pod oblong-linear, flattish, not bordered. Flowers large and showy, 1–3 on a peduncle. Stipules, bracts, and bractlets persistent, striate.

37. HARDENBERGIA. Keel small,[1] much shorter than the wings, incurved, blunt: standard large in proportion, rounded, spreading. Calyx short, 5-toothed, the 2 upper teeth united. Style short, naked. Pod linear, not bordered. Flowers rather small, in racemes. Stipules and bracts small, striate, mostly deciduous. Leaflets mostly single.

38. KENNEDYA. Keel incurved, blunt or acute, mostly equalling or exceeding the wings: standard broad, spreading. Calyx 5-lobed: 2 upper lobes partly united. Style naked. Pod linear, not bordered. Flowers showy, red, single or few on the peduncle. Bracts and stipules striate.

= = *Flowers yellow (sometimes purple-tinged outside): ovules only 2: pod 1–2-seeded.*

39. RHYNCHOSIA. Keel of the corolla incurved at the apex: standard spreading. Calyx 4–5-parted or lobed. Pod short and flat. Flowers small. Leaves mostly soft-downy and resinous-dotted, sometimes of a single leaflet.

§ 4. *Herbs, with abruptly pinnate leaves, the common petiole terminated by a tendril, by which the plant climbs or supports itself, or in many low species the tendril reduced to a mere bristle or tip, or in* Cicer, *which has toothed leaflets, an odd leaflet commonly takes its place: peduncles axillary: stamens almost always diadelphous. Cotyledons very thick, so that they remain underground in germination, as in the Pea.*

* *Leaflets entire or sometimes toothed at the apex: radicle bent on the cotyledons: style inflexed: pod flat or flattish.*

40. PISUM. Lobes of the calyx leafy. Style rigid, dilated above and the margins reflexed and joined together so that it becomes flattened laterally, bearded down the inner edge. Pod several-seeded: seeds globose. Flowers large. Leaflets only 1 – 3 pairs.
41. LATHYRUS. Lobes of the calyx not leafy. Style flattened above on the back and front, bearded down one face. Pod several-seeded. Seeds sometimes flattish. Leaflets few or several pairs.
42. VICIA. Style slender, bearded or hairy only at the apex or all round the upper part. Pod 2 – several-seeded. Seeds globular or flattish. Leaflets few or many pairs.
43. LENS. Lobes of the calyx slender. Style flattish on the back, and minutely bearded down the inner face. Pod 1 – 2-seeded. Seeds flattened, lenticular. Flowers small.

* * *Leaflets toothed all round, and usually an odd one at the end in place of a tendril: style incurved, naked: radicle of the embryo almost straight.*

44. CICER. Calyx 5-parted. Pod turgid oblong, not flattened, 2-seeded. Seeds large, irregularly rounded-obovate, pointed. Peduncle mostly 1-flowered.

B. *Stamens separate to the base.* (*Plants not twining nor climbing.*)

§ 1. *Leaves simple or of 3 digitate leaflets.*

45. CHORIZEMA. Somewhat shrubby, with simple and spiny-toothed leaves, scarcely any stipules, and orange or copper-red flowers. Standard rounded kidney-shaped: keel straight, much shorter than the wings. Pod ovoid, turgid, several-seeded.
46. BAPTISIA. Herbs, with simple entire sessile leaves and no stipules, or mostly of 3 leaflets with deciduous or persistent stipules. Flowers yellow, blue, or white. Standard erect, with the sides turned back, about equalled by the oblong and straightish wings and keel. Pod inflated, coriaceous, stalked in the calyx, many-seeded.
47. THERMOPSIS. Pod scarcely stalked, linear, flat. Otherwise as Baptisia.

§ 2. *Leaves odd-pinnate.*

48. CLADRASTIS. Trees, with large leaflets, no obvious stipules, and hanging terminal panicles of white flowers. Standard turned back: the nearly separate straightish keel-petals and wings oblong, obtuse. Pod short-stalked in the calyx, linear, very flat, thin, marginless, 4 – 6-seeded. Base of the petioles hollow and covering the axillary leaf-buds of the next year.
49. SOPHORA. Trees, shrubs, or herbs, with numerous leaflets, and mostly white or yellow flowers in terminal racemes or panicles. Keel-petals and wings oblong, obtuse, usually longer than the broad standard. Pod commonly stalked in the calyx, terete, several-seeded, fleshy or almost woody, hardly ever opening, but constricted across into mostly 1-seeded portions.

II. BRASILETTO FAMILY. Flowers more or less irregular, but not papilionaceous: when they seem to be so the petal answering to the standard will be found to be *within* instead of outside of the other petals. Stamens 10 or fewer, separate. The leaves are sometimes twice pinnate, which is not the case in the true Pulse Family. Embryo of the seed straight, the radicle not turned against the edge of the cotyledons.

§ 1. *Leaves simple and entire. Corolla appearing as if papilionaceous.*

50. CERCIS. Trees, with rounded heart-shaped leaves, minute early deciduous stipules, and small but handsome red-purple flowers in umbel-like clusters on old wood, earlier than the leaves, rather acid to the taste. Calyx short,

5-toothed. Petals 5, the one answering to the standard smaller than the wing-petals and covered by them; the keel-petals larger, conniving but distinct. Stamens 10, declining with the style. Pod linear-oblong, flat, thin, several-seeded, one edge wing-margined.

§ 2. *Leaves simply abruptly pinnate. Calyx and corolla almost regular.*

51. CASSIA. Flowers commonly yellow. Calyx of 5 nearly separate sepals. Petals 5, spreading, unequal (the lower larger) or almost equal. Stamens 10 or 5, some of the upper anthers often imperfect or smaller, their cells opening by a hole or chink at the apex. Pod many-seeded.

§ 3. *Leaves, or at least some of them, twice-pinnate.*

52. CÆSALPINIA. Trees or shrubs, chiefly tropical, with mostly showy red or yellow perfect flowers. Calyx deeply 5-cleft. Petals 5, broad, spreading, more or less unequal. Stamens 10, declining, along with the thread-shaped style. Pod flat.

53. GYMNOCLADUS. Tall, thornless tree, with large compound leaves, no stipules, and diœcious or polygamous whitish regular flowers, in corymb-like clusters or short racemes terminating the branches of the season. Calyx tubular below, and with 5 spreading lobes, the throat bearing 5 oblong petals and 10 short stamens, those of the fertile flowers generally imperfect. Pod oblong, flat, very hard, tardily opening, with a little pulp or sweetish matter inside, containing few or several large and thick hard seeds (over ½′ in diameter); the fleshy cotyledons remaining underground in germination.

54. GLEDITSCHIA. Thorny trees, with abruptly twice pinnate or some of them once pinnate leaves, the leaflets often crenate-toothed, inconspicuous stipules, and small greenish polygamous flowers in narrow racemes. Calyx 3–5-cleft, the lobes and the 3–5 nearly similar petals narrow and spreading. Stamens 3–10. Pod flat, very tardily opening, often with some sweetish matter around the 1–several flat seeds. Cotyledons thin.

III. MIMOSA FAMILY.

Flowers perfectly regular, small, crowded in heads or spikes; both calyx and corolla valvate in the bud; and the 4 or 5 sepals usually and petals frequently united more or less below into a tube or cup. Stamens 4, 5, or more, often very many, usually more conspicuous than the corolla and brightly colored, the long capillary filaments inserted on the receptacle or base of the corolla. Embryo of the seed straight. Leaves almost always twice pinnate and with small leaflets, or apparently simple and parallel-veined when they have phyllodia in place of true leaves. The foliage and the pods only show the leguminous character.

§ 1. *Stamens once or twice as many as the petals, 4–10. Ours herbs or nearly so, with rose-colored or whitish flowers, and leaves of many small leaflets.*

55. MIMOSA. Calyx commonly minute or inconspicuous. Corolla of 4 or 5 more or less united petals. Pod flat, oblong or linear: when ripe the valves fall out of a persistent slender margin or frame and also usually break up into one-seeded joints.

56. SCHRANKIA. Calyx minute. Corolla funnel-form, the 5 petals being united up to the middle. Stamens 10. Pod rough-prickly all over, long and narrow, splitting lengthwise when ripe into 4 parts.

57. DESMANTHUS. Calyx 5-toothed. Corolla of 5 separate petals. Stamens 5 or 10. Pod flat, smooth, linear or oblong, 2-valved, no persistent margin.

§ 2. *Stamens numerous, or more than 10. Ours all shrubs or trees.*

58. ALBIZZIA. Flowers flesh-color, rose-color, or nearly white; the long stamens monadelphous at the base. Corolla funnel-form, the 5 petals united beyond the middle. Pod flat and thin, broadly linear, not opening elastically. Leaves twice pinnate.

59. ACACIA. Flowers yellow or straw-color: the stamens separate and very numerous. Corolla of 4 or 5 separate or partly united small petals. Pod various.

1. LUPINUS, LUPINE. (*Old Latin name, from lupus, a wolf, because Lupines were thought to destroy the fertility of the soil.*)

* *Wild species of Atlantic States, in sandy soil : fl. in spring.* ♃

L. perénnis, WILD L. Somewhat hairy; with erect stem 1° – 1½° high, 7 – 11 spatulate oblong or oblanceolate green leaflets, and a long raceme of showy purplish-blue (rarely pale) flowers, in late spring.

L. villòsus, ONE-LEAVED L. Silky-downy, with short spreading or ascending stems, oblong or lance-oblong simple leaves, and a dense raceme of blue, purple, or rose-colored flowers. Near the coast, from North Carolina S.

* * *Cultivated for ornament : fl. summer.*

L. polyphýllus, MANY-LEAVED L., is the principal hardy perennial species of the gardens, from Oregon and California, 3° – 4° high, rather hairy, with 13 – 15 lanceolate or oblanceolate leaflets, and a very long dense raceme of blue, sometimes purple, variegated, or even white flowers, in June. ♃

L. mutàbilis, cult. as an annual, from South America, is tall, very smooth throughout, with about 9 narrow-oblong blunt leaflets, and very large sweet-scented violet-purple flowers (or a white variety), with yellow and a little red on the standard.

L. densiflòrus, of California (where there are many fine Lupines), 1° – 2° high, is well marked by the numerous white flowers forming distinct and separate whorls in the long raceme. ①

L. álbus, of Eu., which the ancients cultivated as pulse, has the several obovate-oblong leaflets smooth above, but hairy beneath, white flowers alternate in the raceme, and large smooth pods. ①

L. hirsùtus, cult. in old gardens, from Eu., is clothed with soft white hairs, the leaflets spatulate-oblong; flowers in loose whorls in the raceme, blue, with rose-color and white varieties; pods very hairy. ①

L. lùteus, the old YELLOW L. of the gardens, from Eu., silky-hairy, rather low; with yellow flowers in whorls crowded in a dense spike. ①

2. CROTALÀRIA, RATTLEBOX. (From Greek word for *a rattle*, the seeds rattling in the coriaceous inflated pod.) Native, in sandy soil: fl. yellow, in summer.

C. sagittàlis. Low, 3′ – 6′ high, branching, beset with rusty-colored spreading hairs, with nearly sessile oval or lance-oblong leaves, and 2 or 3 flowers on the peduncle. ①

C. ovàlis. Spreading, rough with appressed hairs; leaves short-petioled, oval, oblong, or lanceolate; peduncle with 3 – 6 scattered flowers. ♃

3. GENÍSTA, WOAD-WAXEN, WHIN. (Celtic word: *little bush*.)

G. tinctòria, DYER'S W. or GREEN-WEED. Nat. from Eu. in sterile soil E., especially in Mass.: low and undershrubby, not thorny, with lanceolate leaves, and bright yellow rather small flowers somewhat racemed at the end of the striate-angled green branches, in early summer.

4. CÝTISUS. (Ancient Greek name, after an island where it grows.) The following are the only species generally cultivated.

C. (or **Sarothámnus**) **scopàrius,** SCOTCH BROOM. Shrub, from Europe, 3° – 5° high, smooth, with long and tough erect angled and green branches, bearing small leaves, the lower short-petioled and with 3 obovate leaflets, the upper of a single sessile leaflet, and in the axils large and showy golden yellow flowers on slender pedicels; calyx with 2 short and broad lips; style and stamens slender, held in the keel, but disengaged and suddenly starting upward when touched (as when bees alight on the deflexed keel), the style coiling spirally; pod hairy on the edges. Hardy in gardens N.; running wild in Virginia: fl. early summer.

IRISH BROOM, so called, but is from Portugal, is another species, not hardy here. SPANISH BROOM is SPARTIUM JUNCEUM, of another genus.

C. Canariénsis, from the Canary Islands, is cultivated in conservatories; a shrub with crowded slender branches, soft-hoary leaves of 3 very small obovate leaflets, and small yellow sweet-scented flowers, produced all winter.

5. LABÚRNUM. (Ancient Latin name. Genus separated from Cytisus from the different appearance, and the seeds destitute of strophiole or appendage at the scar.)

L. vulgàre, Common Laburnum, Golden-Chain, or Bean-Trefoil-Tree of Europe. Planted for ornament, a low tree, with smooth green bark, slender-petioled leaves of 3 oblong leaflets (2′ – 3′ long), and pretty large showy golden-yellow flowers hanging in long racemes, in late spring; pods with one thicker edge.

6. TRIGONÉLLA. (Old name, from Greek word for *triangular*, from the shape of the corolla or the seeds.) Low herbs. T. Cærùlea is the plant used in Switzerland for imparting the flavor like that of Melilot to certain kinds of cheese.)

T. Fœnum-Græcum, Fenugreek. Occasionally cult. in gardens, in Europe a forage and popular medicinal plant, strong-scented; with wedge-oblong leaflets, one or two nearly sessile small flowers in the axils, yellowish or whitish corolla, and a linear long-pointed and somewhat curved pod 2′ – 4′ long, with veiny sides. ①

7. MEDICÀGO, MEDICK. (The old name of Lucerne, because it came to the Greeks from *Media*.) All natives of the Old World: a few have run wild here. Fl. all summer.

* *Flowers violet-purple or bluish.* ♃

M. sativa, Lucerne or Spanish Trefoil. Cultivated for green fodder, especially S.: stems erect, 1° – 2° high, from a long deep root; leaflets obovate-oblong; racemes oblong; pod several-seeded, linear, coiled about 2 turns.

* * *Flowers yellow.* ① ②

M. lupulìna, Black Medick, Nonesuch. A weed or pasture plant, in dry or sandy fields, &c.: low, spreading, downy, with wedge-obovate leaflets, roundish or at length oblong heads or spikes of small flowers, and little kidney-shaped 1-seeded pods turning black when ripe.

M. maculàta, Spotted M. Waste sandy places, S. & E.: spreading or trailing; with broadly inversely heart-shaped leaflets marked with a dark spot, 3 – 5-flowered peduncles, and a flat pod compactly coiled three or more turns, its thickish edge beset with a double row of curved prickles.

M. denticùlata, like the last, but rarer, with pod of looser coils, sharp edge, and mostly shorter prickles.

M. scutellàta, Snail Medick, Beehive. Cult. occasionally in gardens for its curious pods, which are pretty large, coiled up like a snail-shell, in many turns, smooth and even.

8. MELILÒTUS, MELILOT, SWEET CLOVER. (From Greek words for *honey* and *Lotus*, i. e. *Sweet Lotus:* foliage sweet-scented, especially in drying.) Natives of the Old World; somewhat cult. in gardens, &c., and running wild in waste or cultivated ground: fl. all summer. ① ②

M. àlba, White M., Bokhara or Tree Clover. Tall, 3° – 6° high, branching, with obovate or oblong leaflets truncately notched at the end, and loose racemes of white flowers. Has been cult. for green fodder.

M. officinàlis, Yellow M. Less tall, 2° – 3° high, with merely blunt leaflets and yellow flowers.

9. TRIFÒLIUM, CLOVER, TREFOIL. (Latin name: *three leaflets.*)

* *Low, insignificant weeds, nat. from Europe in dry waste fields, &c.* ①

+ *Flowers yellow, in round heads, produced through late summer and autumn, reflexed and turning chestnut-brown, dry and papery with age.*

T. agràrium, Yellow Hop-C. Smoothish, 6′ – 12′ high, with obovate-oblong leaflets all nearly sessile on the end of the petiole; heads rather large.

T. procùmbens, Low Hop-C. Smaller, spreading, rather downy, the wedge-obovate leaflets notched at the end, the middle one at a little distance from the others.

+ + *Flowers flesh-color or whitish with a purplish spot, in a very soft silky head.*

T. arvénse, Rabbit-foot or Stone C. Erect, silky-downy, especially the oblong or at length cylindrical grayish heads or spikes, the corollas almost concealed by the plumose-silky calyx; leaflets narrow.

* * *Larger, rose-red-flowered Clovers, cult. from Europe for fodder, or running wild: heads thick and dense: corolla tubular, withering away after flowering: flowers sweet-scented, in summer.* ♃

T. praténse, Red C. Stems ascending; leaflets obovate or oval, often notched at the end and with a pale spot on the face; head closely surrounded by the uppermost leaves.

T. mèdium, Zigzag C., with a zigzag stem, more oblong entire and spotless leaves, and head usually stalked, is rare, but has run wild E., and passes into the last.

* * * *Low, wild Clovers, or one cult. from Europe, with spreading or running stems, and mostly pale or white flowers (remaining and turning brownish in fading) on pedicels, in round umbels or heads, on slender naked peduncles: fl. spring and summer.*

T. refléxum, Buffalo C. Wild S. and especially W.: somewhat downy, with ascending stems 6′ – 12′ high, obovate-oblong finely-toothed leaflets, heads and rose-red and whitish flowers fully as large as in Red Clover, calyx-teeth hairy, and pods 3 – 5-seeded. ① ②

T. stoloníferum, Running Buffalo C. Prairies and oak-openings W.: like the last, or a variety of it, but some of the stems forming runners, leaflets broadly obovate or inversely heart-shaped, flowers barely tinged with purple, and pods 2-seeded. ① ♃

T. Caroliniànum, Carolina C. Fields and pastures S.: a little downy, spreading in tufts 5′ – 10′ high, with small inversely heart-shaped leaflets, broad stipules, and small heads, the purplish corolla hardly longer than the lanceolate calyx-teeth. ♃

T. rèpens, White C. Fields, &c. everywhere, invaluable for pasturage: smooth, with creeping stems, inversely heart-shaped leaflets, long and slender petioles and peduncles, narrow stipules, loose umbel-like heads, and white corolla much longer than the slender calyx-teeth. ♃

10. PETALOSTÈMON, Prairie Clover. (Name composed of the Greek words for *petal* and *stamen* combined.) In prairies, pine-barrens, &c. W. and S.: flowers never yellow. ♃

* *Heads crowded in a corymb, leafy-bracted: fl. late in autumn.*

P. corymbòsus. In southern pine-barrens; 2° high, with leaves of 3 – 7 filiform leaflets, and white flowers, the slender teeth of calyx becoming plumose.

* * *Heads or mostly spikes single terminating stems: fl. summer.*

P. violàceus. Prairies W.: smoothish or pubescent, 1° – 2° high, with mostly 5 narrow-linear leaflets, a short spike even when old, rose-purple flowers, and hoary calyx.

P. càrneus. Dry barrens S.: smooth, with branching stems, 5 – 7 linear leaflets, long-peduncled short spikes, flesh-color or pale rose flowers, and glabrous calyx.

P. càndidus. Prairies W. & S.: smooth, 2° – 3° high, with 7 – 9 lanceolate or linear-oblong leaflets, long-peduncled spikes, with awn-pointed bracts, and white flowers.

There are besides one or two rarer species W., and several more far W. & S.

11. DÀLEA. (Named for an English botanist, *Thomas Dale.*) There are many species S. W. beyond the Mississippi.

D. alopecuroides. Alluvial river banks W. & S.; with erect stem 1° – 2° high, smooth leaves of many linear-oblong leaflets, and whitish small flowers in a dense silky spike, in summer. ①

12. AMÓRPHA, FALSE INDIGO. (Name, *amorphous*, wanting the ordinary form, from the absence of four of the petals.) There are usually little stipels to the leaflets. Fl. summer.

A. fruticósa, COMMON A. River-banks from Penn. S. & W.; a tall or middle-sized shrub, smoothish, with petioled leaves of 15 – 25 oval or oblong leaflets, violet or purple flowers in early summer, and mostly 2-seeded pods.

A. herbàcea (but it is not an herb) of low pine-barrens S., 2° – 4° high, often downy, has the leaflets more rigid, dotted, and crowded, villous calyx-teeth, later blue or white flowers, and 1-seeded pods.

A. canéscens, called LEAD-PLANT; in prairies and on rocky banks W. and S. W.; 1° – 3° high, hoary with soft down, with sessile leaves of 29 – 51 elliptical leaflets, smoothish above when old, violet-purple flowers in late summer, and 1-seeded pods.

13. PSORÀLEA. (Greek word for *scurfy*, from the roughish dots or glands on the leaves, calyx, &c.) Wild S. & W.: fl. early summer, violet, bluish, or almost white. ♃

* *Leaves pinnately 3-foliolate, i. e. the side-leaflets a little below the apex of the common petiole, or the uppermost of a single leaflet.*

P. Onóbrychis. River-banks, Ohio to Illinois and S.: 3° – 5° high, nearly smooth, with lance-ovate taper-pointed leaflets 3′ long, small flowers in short-peduncled racemes 3′ – 6′ long; pods rough and wrinkled.

P. melilotoìdes. Dry places, W. & S.: 1° – 2° high, somewhat pubescent, slender, with lanceolate or lance-oblong leaflets, oblong spikes on long peduncles, and strongly wrinkled pods.

* * *Leaves digitate, of 3 – 7 leaflets.*

P. Lupinéllus. Dry pine-barrens S.: smooth and slender, with 5 – 7 very narrow or thread-shaped leaflets, small flowers in loose racemes, and obliquely wrinkled pods.

P. floribúnda. Prairies from Illinois S. W.: bushy-branched and slender, 2° – 4° high, somewhat hoary when young, with 3 – 5 linear or obovate-oblong much dotted leaflets, small flowers in short panicled racemes, and glandular-roughened pods.

P. canéscens. Dry barrens S. E. Bushy-branched, 2° high, hoary-pubescent, with 3 (or upper leaves of single) obovate leaflets, loose racemes of few flowers, and a smooth pod.

P. argophýlla. Prairies N. W., mostly across the Mississippi, widely branched, 1° – 3° high, silvery white all over with silky hairs, with 3 – 5 broad-lanceolate leaflets and spikes of rather few largish flowers.

P. esculénta, POMME BLANCHE of the N. W. Voyageurs; the turnip-shaped or tuberous mealy root furnishing a desirable food to the Indians N. W.: low and stout, 5′ – 15′ high, roughish hairy, with 5 lance-oblong or obovate leaflets, a dense oblong spike of pretty large (½′ long) flowers, and a hairy pointed pod.

14. ONÓBRYCHIS, SAINFOIN. (Name from Greek, means *Asses-food*.)

O. sativa, COMMON S. Sparingly cult. from Europe as a fodder plant, but not quite hardy N.; herb 1° – 2° high, with numerous oblong small leaflets, brown and thin pointed stipules, and spikes of light pink flowers on long axillary peduncles, in summer, the little semicircular pod bordered with short prickles or teeth. ♃

15. STYLOSÁNTHES, PENCIL-FLOWER. (Name from Greek words for *column* and *flower*, the calyx being raised on its stalk-like base. The application of the popular name is not obvious.)

S. elàtior, of pine-barrens from New Jersey and Illinois S., is an inconspicuous low herb, in tufts; the wiry stems downy on one side; leaflets lanceolate, with strong straight veins; flowers orange-yellow, small, in little clusters or heads, in late summer. ♃

16. LESPEDÈZA, BUSH-CLOVER. (Named for *Lespedez*, a Spanish Governor of Florida.) All grow in sandy or sterile soil; fl. late summer and autumn. ♃

* *Native species: stipules and bracts minute.*

+ *Flowers in close spikes or heads on upright (2° – 4° high) simple rigid stems: corolla cream-color or white with a purple spot, about the length of the silky-downy calyx.*

L. capitàta. Leaflets oblong or sometimes linear, silky beneath, thickish; peduncles and petioles short; flowers in short spikes or heads; calyx much longer than the pod.

L. hírta. Leaflets roundish or oval, hairy or downy; petioles and peduncles slender; spikes becoming rather long and loose.

+ + *Flowers violet-purple, scattered or in open panicles or clusters, slender-peduncled, also usually some more fertile ones, mostly without petals, in small sessile clusters.*

L. violàcea. The commonest, and very variable, bushy-branching, erect or spreading, with leaflets varying from oval to linear, and minutely whitish-downy beneath, or sometimes silky; the ordinary flowers loosely panicled.

L. procúmbens. Soft-downy, except the upper surface of the oval or oblong leaflets, slender and trailing; peduncles slender and few-flowered.

L. rèpens. Smooth, except some minute and scattered close-pressed hairs, very slender, prostrate; leaflets obovate or oval (½′ long).

* * *Naturalized in States, from China or Japan: stipules ovate or lance-ovate, striate, longer than the very short petiole.*

L. striàta. Introduced (more than 25 years ago) in some unknown way into the Southern Atlantic States, now rapidly spreading and occupying old fields and waste places, to the great benefit of the country, being greedily fed upon by cattle; it is low and spreading, 3′ – 10′ high, much branched, almost smooth, with oblong or wedge-oblong leaflets ¼′ – ½′ long, and 1 – 3 small purplish flowers almost sessile in the axils.

17. DESMÒDIUM, TICK-TREFOIL. (Name from Greek, means *bound together*, from the connected joints of the pod.) ♃ We have many native species, common in open woods and copses; fl. late summer: the following are the more common.

§ 1. *Native species: the little joints of the pod adhere to clothing or to the coats of animals: flowers sometimes turning greenish in withering.*

* *Pod raised far above the calyx on a slender stalk of its own, straightish on the upper margin, divided from below into not more than 4 joints: flowers in one long-stalked naked terminal raceme or panicle: plants smooth, 1° – 3° high: stipules bristle-form.*

D. nudiflòrum. Flower-stalk and leaf-bearing stem rising separately from a common root; the leaves all crowded on the summit of the latter, and with broadly ovate bluntish leaflets, pale beneath.

D. acuminàtum. Flower-stalk terminating the stem, which bears a cluster of leaves; the large leaflets (4′ – 5′ long) round-ovate with a tapering point, or the end one blunter, green both sides.

* * *Pod little if at all raised above the calyx.*

+ *Stems erect, 3° – 6° high: stipules large, ovate or lance-ovate and pointed, striate, persistent, the bracts similar but deciduous: flowers large for the genus: racemes panicled: pods of 4 – 7 rhombic-oblong joints, each joint about ½′ long.*

D. cuspidàtum. Very smooth, with a straight stem, lance-ovate and taper-pointed leaflets (3′ – 5′ long) longer than the common petiole, and pod with smoothish joints.

D. canéscens. Hairy, with branching stems, pale leaves; the ovate bluntish leaflets about the length of the common petiole, reticulated beneath and both sides roughish with fine close pubescence; joints of pod very adhesive.

+ + *Stems erect, 2° – 6° high : stipules and bracts mostly awl-shaped, small and inconspicuous or early deciduous : racemes panicled.*

++ *Common petiole slender : flowers smallish : joints of pod 3 – 5, unequal-sided.*

D. viridiflòrum. Stem and lower surface of the broad ovate blunt leaflets clothed with white and soft-velvety down. Pine-barrens, from New Jersey S.

D. lævigàtum. Stem and the thickish ovate and bluntish leaflets smooth or nearly so. From New Jersey S.

D. Dillènii. Stem and the oblong or oblong-ovate bluntish thin leaflets finely pubescent; the latter 2′ – 3′ long.

D. paniculàtum. Smooth or nearly so throughout; leaflets lanceolate or lance-oblong, tapering to a blunt point, 3′ – 5′ long; panicle loose.

D. strìctum. Slender stems smooth below, above and the narrow panicle rough-glandular; leaflets linear, blunt, reticulated, very smooth, 1′ – 2′ long. From New Jersey S.

++ ++ *Common petiole very short.*

D. Canadénse. Stem hairy, 3° – 6° high, leafy up to the panicle; leaflets lance-oblong, blunt, 2′ – 3′ long: racemes dense, the pink-purple flowers larger than in any other, fully ½′ long; bracts large, conspicuous before flowering. Chiefly N. & W.

D. sessilifòlium. Stem pubescent, 2° – 4° high; the long panicle naked; common petiole hardly any; leaflets linear or linear-oblong, blunt, reticulated, rough above, downy beneath; flowers small. Penn. to Ill. & S.

+ + + *Stems ascending or spreading, 1° – 3° long: stipules and bracts awl-shaped and deciduous: panicle naked, loose: flowers small: pod of 2 or 3 small oval or roundish joints.*

D. rígidum. The largest of this section, with rough-pubescent stems sometimes erect; leaflets ovate-oblong, blunt, thickish, roughish and reticulated, 1′ – 2½′ long, longer than the common petiole.

D. ciliàre. More or less hairy, slender, very leafy; common petiole very short; leaflets round-ovate or oval, thickish, ⅓′ – 1′ long.

D. Marilándicum. Smooth or nearly so, slender; leaflets ovate or roundish, thin, the lateral ones about the length of the slender petiole: otherwise like the preceding.

+ + + + *Stems reclining or prostrate: racemes axillary and terminal.*

D. lineàtum. Smoothish; stem striate-angled; stipules awl-shaped, deciduous; leaflets orbicular, 1′ or less in length, much longer than the common petiole; flowers and 2 or 3 rounded joints of the pod small. Pine-barrens from Maryland S.

D. rotundifòlium. Soft-hairy; stems running 3° – 5° along the ground; leaflets orbicular, about 3′ long; stipules ovate, striate, taper-pointed, persistent; flowers and the 3 – 5 rhombic-oval joints of the pod rather large.

§ 2. *Exotic, conservatory species.*

D. gýrans, of East Indies, one of the most extraordinary plants known, is readily grown as a tender annual: the smooth leaves are remarkable for their movements; the end leaflet slowly changing position with the light; the lateral ones, very much smaller, moving pretty rapidly up and down, in elliptical sweeps, through the day when the temperature is about 80° Fahr.

18. ÆSCHYNÓMENE, SENSITIVE JOINT-VETCH. (From Greek word meaning *ashamed*, the leaflets of some species being more or less sensitive to the touch in the manner of the common Sensitive Plant.) Stamens commonly in two sets of 5 each. Pod resembling that of Desmodium. Fl. summer.

Æ. híspida. Stem rough-bristly, 2° – 4° high; leaflets very many, broadly linear; joints of the bristly pod 6 – 10, nearly square. Low grounds from Penn. S. ①

Æ. viscídula. Stems clammy-pubescent, slender, spreading on the ground; leaflets 7 – 9, obovate; joints of the bristly pod 2 or 3, half-orbicular. Sandy shores S. ①

19. CORONÍLLA. (Latin, diminutive of *corona*, a crown.) Cult. from Europe for ornament. ♃

C. vària, PURPLE CORONILLA. Hardy herb, spreading from underground running shoots, smooth, 2° high, with 15 – 21 obovate-oval or oblong small leaflets, and head-like umbels of handsome pink-purple and white or white and *lilac flowers, all summer.*

C. glaùca, YELLOW SWEET-SCENTED C. Green-house shrubby plant, with 5 – 9 glaucous obovate or obcordate leaflets, the terminal largest, and head-like umbels of sweet-scented yellow flowers; the claws of the petals not lengthened.

20. ÁRACHIS, PEANUT, GROUND-NUT. (Meaning of name obscure.)

A. hypogæa, the only common species, originally from South America, cult. S.: the nut-like pods familiar, the oily fleshy seeds being largely eaten by children, either raw or roasted. ①

21. SESBÁNIA. (Arabic name *Sesban*, a little altered.) Fl. late summer.

S. macrocárpa, wild in swamps S., is tall, smooth, with linear-oblong leaflets, few flowers on a peduncle shorter than the leaves, the corolla yellow with some reddish or purple, followed by linear narrow hanging pods 8′ – 12′ long, containing many seeds. ①

S. vesicària (or GLOTTÍDIUM FLORIDÀNUM), in low grounds S., resembles the preceding in foliage and small yellow flowers, but has a broadly oblong turgid pod, only 1′ or 2′ long, pointed, raised above the calyx on a slender stalk of its own, only 2-seeded, the seeds remaining enclosed in the bladdery white lining of the pod when the outer valves have fallen. ①

S. grandiflòra (or AGÀTI GRANDIFLORA), a shrub or tree-like plant of India, run wild in Florida, occasionally cult. for ornament S., has very large flowers, 3′ – 4′ long, white or red, and slender hanging pods 1° or so long.

22. CARAGÀNA, PEA-TREE. (Tartar name.) Natives of Siberia and China: planted for ornament, but uncommon, scarcely hardy N.

C. arboréscens. SIBERIAN P. Shrub or low tree, with spiny stipules, 4 – 6 pairs of oval-oblong downy leaflets, a soft tip to the common petiole, and solitary yellow flowers, in spring.

C. frutéscens, has soft stipules, and only 2 pairs of obovate leaflets crowded at the summit of the petiole, which is tipped with a spiny point.

C. Chamlàgu, CHINESE P., a low or spreading shrub, has 2 rather distant pairs of smooth oval or obovate leaflets, the stipules and tip of the petiole spiny.

23. INDIGÓFERA, INDIGO-PLANT. (Name means *producer of indigo.*) Ours are tall perennials, sometimes with woody base, and numerous small flowers in racemes, of S. States, in dry soil: fl. summer.

I. Caroliniàna. Wild from North Carolina S.: smoothish, with 10 – 15 obovate or oblong pale leaflets, racemes longer than the leaves, flowers soon brownish, and oblong veiny pods only 2-seeded.

I. tinctòria. This and the next furnish the indigo of commerce, were cult. for that purpose S., and have run wild in waste places: woody at base, with 7 – 15 oval leaflets, racemes shorter than the leaves, the deflexed knobby terete pods curved and several-seeded.

I. Ánil differs mainly in its flattish and even pods thickened at both edges.

24. TEPHRÒSIA, HOARY PEA. (From Greek word meaning *hoary.*) *Native plants, of dry, sandy or barren soil, chiefly S.: fl. summer.*

* *Stem very leafy up to the terminal and sessile dense raceme or panicle.*

T. Virginiàna. Called CATGUT, from the very tough, long and slender roots; white silky-downy, with erect and simple stem 1° – 2° high, 17 – 29 linear-oblong leaflets, pretty large and numerous flowers yellowish-white with purple, and downy pods. Common N. & S.

* * *Stems branching, often spreading or decumbent: leaves scattered; racemes opposite the leaves, long-peduncled: flowers fewer and smaller: pubescence mostly yellowish or rusty.*

T. spicàta. From Delaware S.: 1° – 2° high, loosely soft-hairy, with 9 – 15 wedge-oblong or obovate leaflets, and 6 – 10 rather large scattered white and purple flowers in the raceme or spike.

T. hispídula. From Virginia S.: low, closely pubescent or smoothish, with 11 – 15 oblong small leaflets, the lowest pair above the base of the petiole, and 2 – 4 small reddish-purple flowers.

T. chrysophýlla. From Georgia S. & W.: nearly prostrate, with 5 – 7 wedge-obovate leaflets, smooth above and yellowish silky beneath, the lowest pair close to the stem; flowers as in the last.

25. ROBÍNIA, LOCUST-TREE. (Dedicated to two early French botanists, *Robin.*) Natives of Atlantic, Middle, and Southern States, planted, and the common Locust running wild N. Fl. late spring and early summer.

R. Pseudacàcia, COMMON L. or FALSE ACACIA. Tree of valuable timber, with naked branchlets, slender and loose hanging racemes of fragrant white flowers, and smooth pods.

R. viscòsa, CLAMMY L. Smaller tree, with clammy branches and stalks, very short prickles, short and dense racemes of faintly rose-colored scentless flowers, and rough clammy pods.

R. híspida, BRISTLY L. or ROSE-ACACIA. Ornamental shrub, with branches and stalks bristly, broad leaflets tipped with a long bristle, large and showy bright rose-colored flowers in close or loose racemes, and clammy-bristly pods.

26. COLÙTEA, BLADDER-SENNA. (Derivation of name obscure: the English name refers to the bladdery pods and to the leaves having been used as a substitute for those of Senna.)

C. arboréscens, COMMON B. European shrub, planted in gardens, with 7 – 11 oval and rather truncate leaflets, a raceme of 5 – 10 yellow flowers, in summer, succeeded by the large very thin-walled closed pods.

C. cruénta, ORIENTAL B., with obovate notched leaflets, fewer flowers saffron-colored or reddish, and pods opening by a little slit before they are ripe, is scarcely hardy N.

27. ASTRÁGALUS, MILK-VETCH. (Old Greek name of the ankle-bone and of some leguminous plant; application and meaning uncertain.) Very many native species west of the Mississippi.

A. Canadénsis. River-banks, the only widely common species; rather coarse, 1° – 4° high, slightly pubescent, with leaves of numerous leaflets, long dense spikes of greenish cream-colored flowers, in summer, followed by small and coriaceous ovoid pods, completely divided by a longitudinal partition. ♃

A. Coòperi. Gravelly shores N. & W.: resembles the foregoing, but smoother, 1° – 2° high, with small white flowers in a short spike, and inflated ovoid pods about 1′ long, thin-walled, and not divided internally; fl. in early summer. ♃

A. glàber. Pine-barrens S.: nearly smooth, 2° high, with very many oblong-linear small leaflets, loosely many-flowered spikes of white flowers, in spring, succeeded by oblong curved and flattish 2-celled pods. ♃

A. caryocárpus, GROUND PLUM of the Western *voyageurs*, so called from the fruit, which is of the size and shape of a small plum, and fleshy, but becoming dry and corky, very thick-walled, 2-celled; the plant low, smoothish, with many small narrow oblong leaflets, and short racemes or spikes of violet-purple or nearly white flowers, in spring: common along the Upper Mississippi and W. and S. on the plains. ♃

A. villòsus. Pine-barrens S.: low and spreading, loosely hoary-hairy, with about 13 oblong leaflets notched at the end, a short and dense raceme or spike of small yellowish flowers, in spring, and an oblong 3-angled curved and soft-hairy pod, its cavity not divided. ♃

28. WISTÀRIA. (Named for *Prof. Wistar* of Philadelphia.) Very ornamental woody twiners: fl. spring.

W. frutéscens, AMERICAN W. Wild along streams W. and S., and cult. for ornament; soft-downy when young, with 9 – 15 lance-ovate leaflets, a dense raceme of showy blue-purple flowers, the calyx narrowish, wing-petals each with one short and one very long appendage at the base of the blade, and a smooth ovary.

W. Sinénsis, CHINESE W. Cult. from China or Japan, barely hardy in New England, faster growing (sometimes 20° in a season) and higher climbing than the other, with longer and more pendent racemes, wing-petals appendaged on one side only, and a downy ovary. Often flowering twice in the season.

29. ÁPIOS, GROUND-NUT, WILD BEAN. (Name from Greek word for *pear*, from the shape of the tubers.) ♃

A. tuberòsa. Wild in low grounds; subterranean shoots bearing strings of edible farinaceous tubers 1′ – 2′ long; stems slender, rather hairy; leaflets ovate-lanceolate; flowers brownish-purple, violet-scented, crowded in short and thick racemes, in late summer and autumn.

30. ERYTHRÌNA. (From Greek word for *red*, which is the usual color of the flowers.)

E. herbàcea. Wild in sandy soil near the coast S.; sending up herbaceous stems 2° – 4° high from a thick woody root or base, some leafy, the leaflets broadly triangular-ovate; others nearly leafless, terminating in a long erect raceme of narrow scarlet flowers, of which the straight and folded lanceolate standard (2′ long) is the only conspicuous part; seeds scarlet: fl. spring.

E. Crista-gàlli. *Cult. in conservatories, from Brazil*; with a tree-like trunk, oval or oblong leaflets, and loose racemes of crimson large flowers, the keel as well as the broad spreading standard conspicuous, the rudimentary wings hidden in the calyx.

31. PHASÈOLUS, BEAN, KIDNEY BEAN. (An ancient name of the Bean.) Fl. summer and autumn.

* *Native species, small-flowered.*

P. perénnis. From Connecticut and Illinois S. in woody places; slender stems climbing high; leaflets roundish-ovate, short-pointed; racemes long and loose, often panicled; flowers small, purple; pods drooping, scimitar-shaped, few-seeded. ♃

P. diversifòlius. Sandy shores, &c.: spreading on the ground, with rough hairy stems, ovate entire or commonly 3-lobed or angled leaflets, peduncles twice the length of the leaves, bearing a small cluster of purplish or at length greenish flowers, and linear nearly terete straight pods. ①

P. hélvolus. Sandy soil, from New Jersey and Illinois S.: more slender than the preceding, sometimes twining a little, with the ovate or oblong leaflets entire or obscurely angled, peduncles several times surpassing the leaves, flowers pale purple, and pods narrower. ♃

P. pauciflòrus. River-banks W. & S.: spreading over the ground, also twining more or less, slender, pubescent, with small oblong-lanceolate or linear leaflets, few and small purplish flowers on a short peduncle, the keel merely incurved, and the straight flat pod only 1′ long. ①

* * *Exotic species, cultivated mainly for food, all with ovate pointed leaflets.* ①

P. vulgàris, COMMON KIDNEY, STRING, and POLE BEAN. Twining, with racemes of white or sometimes dull purplish or variegated flowers shorter than the leaf, linear straight pods, and tumid seeds. Many varieties, among which may be reckoned the next.

P. nànus, DWARF or FIELD BEAN; low and bushy, not twining; seeds very tumid.

P. lunàtus, LIMA BEAN, SIEVA B., &c. Twining, with racemes of small greenish-white flowers shorter than the leaf, and broad and curved or scimitar-shaped pods, containing few large and flat seeds.

P. multiflòrus, SPANISH BEAN, SCARLET RUNNER when red-flowered; twining high, with the showy flowers bright scarlet, or white, or mixed, in peduncled racemes surpassing the leaves; pods broadly linear, straight or a little curved; seeds large, tumid, white or colored.

* * * *Exotic species, cultivated in greenhouses for ornament.* ♃

P. Caracálla, SNAIL-FLOWER. Stem twining extensively, rather woody below, from a tuberous root; leaflets rhombic-ovate, taper-pointed; racemes longer than the leaf; flowers showy, 2′ long, white and purple, the standard as well as the very long-snouted keel, spirally coiled, giving somewhat the appearance of a snail-shell.

32. DÓLICHOS, BLACK BEAN, &c. (Old Greek name of a Bean, meaning *elongated*, perhaps from the tall-climbing stems.)

D. Láblab, EGYPTIAN or BLACK BEAN, cult. from India, for ornament and sometimes for food, is a smooth twiner, with elongated racemes of showy violet, purple, or white flowers, 1′ long, and thick and broadly oblong pointed pods; seeds black or tawny with a white scar. ①

D. Sinénsis, CHINA BEAN, var. **melanophthálmus,** BLACK-EYED BEAN, with long peduncles bearing only 2 or 3 (white or pale) flowers at the end, the beans (which are good) white with a black circle round the scar, is occasionally met with.

33. GALÁCTIA, MILK-PEA. (From a Greek word for *milky*, which these plants are not.) There are several other species in the Southern Atlantic States; a rare one has pinnate leaves. Fl. summer. ♃

G. glabélla. Sandy soil from New Jersey S.: prostrate, nearly smooth, with rather rigid ovate-oblong leaflets, their upper surface shining, a few rather large rose-purple flowers on a peduncle not exceeding the leaves, and a 4 – 6-seeded at length smoothish pod.

G. móllis. Sandy barrens, from Maryland S.: spreading, seldom twining, soft-downy and hoary, even to the 8 – 10-seeded pod; racemes long-peduncled, many-flowered; leaflets oval.

34. AMPHICARPÆA, HOG-PEA-NUT. (Name from Greek words meaning *double-fruited*, alluding to the two kinds of pod.) ♃

A. monoica. A slender much-branched twiner, with brownish-hairy stems, leaves of 3 rhombic-ovate thin leaflets, and numerous small purplish flowers in clustered drooping racemes, besides the more fertile subterranean ones; the turgid pods of the latter hairy: herbage greedily fed upon by cattle: fl. late summer and autumn.

35. CENTROSÈMA, SPURRED BUTTERFLY-PEA. (Name from Greek words meaning *spurred standard*.) ♃

C. Virginiànum. Sandy woods, chiefly S.: trailing and low twining, slender, roughish with minute hairs; leaflets varying from ovate-oblong to linear, very veiny, shining; the 1 – 4-flowered peduncles shorter than the leaves; the showy violet-purple flowers 1′ or 1½′ long, in summer.

36. CLITÒRIA, BUTTERFLY-PEA. (Derivation obscure.) ♃

C. Mariàna, our only species, in dry ground from New Jersey S.: smooth, with erect or slightly twining stem (1° – 3° high), ovate-oblong leaflets pale beneath, very showy light blue flowers 2′ long, single or 2 – 3 together on a short peduncle, and a few-seeded straight pod: fl. summer.

37. HARDENBÈRGIA. (Named for an Austrian botanist.) Australian plants. ♃

H. monophýlla, a choice greenhouse plant, has leaves of a single ovate or lanceolate leaflet 2′ or 3′ long, and slender racemes of small violet-purple flowers; whole plant smooth.

38. KENNÉDYA. (Named for a distinguished English florist.) Australian plants, of choice cultivation in conservatories. ♃

K. rubicúnda, is hairy, free-climbing, with 3 ovate leaflets, and 2–4-flowered peduncles, the dark red or crimson flowers over 1′ long.

39. RHYNCHÒSIA. (Name from the Greek, means *beaked*, of no obvious application.) Chiefly Southern: fl. summer. ♃

R. tomentòsa. Low, soft-downy, in several varieties, erect, spreading, or the taller forms twining more or less, with one or three round or sometimes oblong-oval leaflets, and clusters or racemes of small yellow flowers. Dry sandy soil, from Maryland S.

R. galactoìdes. Bushy-branched, 2°–4° high, not at all disposed to twine, minutely pubescent, with 3 small and rigid oval leaflets, hardly any common petiole, and scattered flowers in the upper axils, the standard reddish outside. Dry sand-ridges, from Alabama S.

40. PÌSUM, PEA. (The old Greek and Latin name of the Pea.) ①

P. sativum, COMMON PEA. Cult. from the Old World: smooth and glaucous, with very large leafy stipules, commonly 2 pairs of leaflets, branching tendrils, and peduncles bearing 2 or more large flowers; corolla white, bluish, purple, or party-colored; pods rather fleshy.

41. LÀTHYRUS, VETCHLING. (Old Greek name.) Some species closely resemble the Pea, others are more like Vetches. Fl. summer.

* *Cult. from Eu., for ornament: stem and petioles wing-margined: leaflets one pair.*

L. odoràtus, SWEET PEA. Stem more or less roughish-hairy; leaflets oval or oblong; flowers 2 or 3 on a long peduncle, sweet-scented, white with the standard rose-color, or purple, with varieties variously colored. ①

L. latifòlius, EVERLASTING PEA. Smooth, climbing high; stems broadly winged; leaflets oval, with parallel veins very conspicuous beneath; flowers numerous in a long-peduncled raceme, pink-purple, also a white variety, scentless. ♃

* * *Native species: stems wingless or merely margined: leaflets 2–8 pairs.* ♃

L. maritimus, BEACH PEA. Sea-shore of New England especially N., and along the Great Lakes: about 1° high, leafy, smooth, with stipules nearly as large as the 8–16 oval crowded leaflets, and the peduncle bearing 6–10 rather large purple flowers.

L. venòsus. Shady banks W. & S.: climbing, with 10–17 more scattered ovate or oblong leaflets, often downy beneath, small and slender stipules, and peduncles bearing many purple flowers.

L. ochroleùcus. Hillsides and banks N. & W.: slender stems 1°–3° high; the leaflets 6–8, glaucous, thin, ovate or oval, larger than the leafy stipules; peduncles bearing several rather small yellowish-white flowers.

L. palùstris. Swamps and wet grounds N. & W.: low, 1°–2° high, with margined or slightly winged stems, small lanceolate stipules, 4–8 leaflets varying from linear to oblong, and peduncles bearing 3–5 rather small purple flowers.

Var. **myrtifòlius,** common W. & S., usually appears very distinct, climbing 2°–4° high, with oblong or oval leaflets, larger and more leaf-like upper stipules, and paler flowers.

42. VÌCIA, VETCH, TARE. (The old Latin name of the genus.)

§ 1. *Flowers several or many on a slender peduncle, in spring or summer: pod several-seeded: wild species in low ground, 1°–4° high.* ♃

* *Peduncle 4–8-flowered: plant smooth.*

V. Americàna. Common N. & W.; with 10–14 oblong and very blunt veiny leaflets, and purplish flowers over ½′ long.

V. acutifòlia. Near the coast S.; with about 4 linear or oblong leaflets, and small blue or purplish flowers.

* * *Peduncle bearing very many small soon reflexed flowers.*

V. Caroliniàna. Smoothish; with 8 – 24 oblong blunt leaflets, and small white or purplish-tipped flowers rather loose or scattered in the slender raceme.

V. Crácca. Only N. & W., rather downy; with 20 – 24 lance-oblong mucronate-pointed leaflets, and a dense spike of blue flowers (nearly ½' long) turning purple.

§ 2. *Flowers 1 – 5 on a slender peduncle, in summer or spring, very small: leaflets oblong-linear, 4 – 8 pairs: pod oblong, only 2 – 4-seeded: slender and delicate European plants, run wild in fields and waste places.* ①

V. tetraspérma. Leaflets blunt; corolla whitish; pod 4-seeded, smooth.

V. hirsùta. Leaflets truncate; corolla bluish; pod 2-seeded, hairy.

§ 3. *Flowers single or few and sessile or short-peduncled in the axil of the leaves, pretty large: pod several-seeded: stem simple, low, not climbing.* ①

V. sativa, COMMON VETCH or TARE. Sometimes cult. for fodder, from the Old World, run wild in some fields: somewhat hairy, with 10 – 14 leaflets varying from oblong or obovate to linear, and notched and mucronate at the apex; flowers mostly in pairs and sessile, violet-purple; seeds tumid.

V. Fàba, BEAN of England, WINDSOR or HORSE-BEAN. Cult. from the Old World for the edible beans (which are not much fancied in this country, where we have better): smooth, with stout erect stem 1° – 2° high, crowded leaves of 2 – 6 oblong leaflets (1½' – 3' long), a mere rudiment of a tendril, and axillary clusters of white flowers having a black spot on each wing; pod thick and fleshy, 2' – 3' long; seeds oval, flattened, large.

43. LENS, LENTIL. (Classical Latin name. The shape of the seed gave the name to the glass lens for magnifying.) ①

L. esculénta, COMMON LENTIL, of Europe, cult. for fodder and for the seeds, but rarely with us: slender plant, barely 1° high, resembling a Vetch, with several pairs of oblong leaflets (½ long), 2 or 3 small white or purplish flowers on a slender peduncle, and a small broad pod, containing 2 orbicular sharp-edged (lens-shaped) seeds, which are generally yellowish or brownish, a sorry substitute for beans, but good for soup.

44. CÌCER, CHICK-PEA. (An old Latin name for the Vetch.) ①

C. arietìnum, COMMON C., of the Old World, called COFFEE-PEA at the West, there cult. for its seeds, which are used for coffee: their shape gave the specific name, being likened to the head of a sheep: plant 9' – 20' high, covered with soft glandular acid hairs; leaves of 8 – 12 wedge-obovate serrate leaflets; peduncle bearing one small whitish flower, succeeded by the turgid small pod.

45. CHORIZÈMA. (A fanciful name of Greek derivation.) ♃

C. ilicifòlia, HOLLY-LEAVED C. Greenhouse-plant from Australia, bushy, with lance-oblong leaves cut into strong spiny teeth or lobes, and racemes of small copper-colored flowers, the wings redder.

46. BAPTÍSIA, FALSE INDIGO. (From Greek word meaning *to dye*, these plants yielding a poor sort of indigo.) Foliage of most species turning blackish in drying: nearly all grow in sandy or gravelly dry soil: fl. spring and early summer. ♃

* *Flowers yellow.*

B. perfoliàta. Low and spreading, smooth and glaucous, with simple round-ovate leaves surrounding the stem (perfoliate, probably answering to united stipules), and single small flowers in their axils; pod small and globular. Carolina and Georgia.

B. tinctòria, COMMON or WILD FALSE-INDIGO. Pale or glaucous, smooth, bushy, 2° high, with 3 small wedge-obovate leaflets, hardly any common petiole, minute deciduous stipules, few-flowered racemes terminating the branches, and small globular pods.

B. lanceolàta. Downy when young, spreading, with 3 thickish blunt leaflets varying from lanceolate to obovate, a very short common petiole, small deciduous stipules, and rather large flowers solitary in the axils and in short terminal racemes, the pod globular and slender-pointed. Common S. & S. W.

B. villòsa. Minutely downy, with stout stems 2° high, 3 spatulate-oblong or wedge-obovate leaflets, becoming smooth above, a very short common petiole, stipules more or less persistent, and many-flowered racemes of large flowers on slender pedicels; the pod minutely downy, oblong, taper-pointed. From Carolina S. W.

* * *Flowers white, in the first cream-color: leaves all of 3 leaflets varying from wedge-obovate to oblanceolate, and flowers in long racemes terminating the branches.*

B. leucophæa. Low and spreading, 1° high, soft-hairy, with persistent large and leaf-like bracts and stipules, reclined one-sided racemes of cream-colored large (1′ long) flowers on slender pedicels, and hoary ovate pods. Open woods, chiefly W.

B. álba. Smooth, 2° – 3° high, with slender widely spreading branches, slender petioles, minute deciduous stipules and bracts, loose erect or spreading long-peduncled racemes of small flowers ($\frac{1}{2}'$ – $\frac{1}{3}'$ long), and cylindrical pods. From Virginia S.

B. leucántha. Smooth and glaucous, stout, 3° – 5° high, with spreading branches, rather short petioles, the lanceolate stipules and bracts deciduous, erect long racemes of large (1′ long) flowers, and oval-oblong pods 2′ long, raised on a stalk fully twice the length of the calyx. Alluvial soil, from Ohio W. & S.

* * * *Flowers blue: leaves of 3 leaflets as in the foregoing.*

B. austràlis. Smooth and stout, pale, erect, 2° – 5° high, with oblong-wedge-shaped leaflets, lanceolate and rather persistent stipules as long as the short petiole, erect racemes of pretty large (nearly 1′ long) flowers on short pedicels, and oval-oblong pods 2′ – 3′ long, on a stalk of the length of the calyx.

47. THERMÓPSIS. (From Greek words meaning that the plants resemble the Lupine.) Flowers yellow. ♃

T. móllis. Wild in open woods from N. Carolina S.: downy, 1° – 2° high, with spreading branches, 3 obovate-oblong leaflets, oblong-ovate leafy stipules, some of them as long as the short petioles, and long narrow-linear spreading pods short-stalked in the calyx: fl. spring. (There are two other species in the Southern Alleghanies.)

T. fabàcea, which is erect with oval leaflets and upright pods, is sparingly cult. from Siberia, and wild in N. W. America.

48. CLADRÁSTIS, YELLOW-WOOD. (Meaning of name obscure, perhaps from Greek for brittle branches.)

C. tinctòria (also named VIRGÍLIA LÙTEA), native of rich woods from E. Kentucky S., planted for ornament, one of the very handsomest and neatest of ornamental trees; with light yellow wood, a close bark like that of Beech, leaves of 7 – 11 parallel-veined oval or ovate leaflets (3′ – 4′ long and smooth, as is the whole plant), and ample hanging panicles (1° or more long) of pretty, delicately fragrant, cream-white flowers, terminating the branchlets of the season, in May or June.

49. SOPHÒRA. (An Arabic name altered.) There is a wild herbaceous species beyond the Mississippi, a low shrubby one on the coast of Florida and a tree in Arkansas and Texas which in its fleshy jointed pod and in appearance much resembles the following: —

S. Japónica, JAPAN S. Planted for ornament, hardy to New England; tree 20° – 50° high, with greenish bark, 11 – 13 oval or oblong acute smooth leaflets, and loose panicles of cream-white flowers, terminating the branches at the end of summer, the fruit a string of fleshy 1-seeded joints.

50. CÉRCIS, RED-BUD, JUDAS-TREE. (Ancient name of the oriental species: the English name from the old notion that this was the tree whereon Judas hanged himself.)

C. Canadénsis, AMERICAN RED-BUD. Wild from New York S. (but probably not in Canada as the name implies): a small, handsome tree, ornamental in spring, when the naked branches are covered with the small but very numerous flowers, of the color of peach-blossoms or redder; the rounded leaves are somewhat pointed, and the pods scarcely stalked in the calyx.

C. Siliquástrum, EUROPEAN R. or JUDAS-TREE. Barely hardy N., except as a shrub; has larger flowers, pod raised out of the calyx on a short stalk, and almost kidney-shaped leaves. A seeming variety of this inhabits Texas and California.

51. CÁSSIA, SENNA. (Ancient name, of obscure meaning.) The following all wild species, the first *sometimes cult. in country gardens*, and the leaves used in place of true, oriental Senna. Fl. summer, in all ours yellow.

§ 1. *Smooth herbs, in rich or alluvial soil, with rather large leaflets, deciduous stipules, flowers in short axillary racemes or crowded in a panicle, and the 10 stamens unequal, some of the upper anthers imperfect.*

C. Marilándica, WILD SENNA. The only common sort at the north, 3°–4° high, with 6–9 pairs of narrow-oblong blunt and mucronate leaflets, a club-shaped gland on the common petiole near the base, bright yellow petals often turning whitish when old, blackish anthers, and linear flat (at first hairy) pods. ♃

C. occidentàlis, WESTERN S. or STYPTIC-WEED. Common S., nat. from South America: 1°–5° high, with 4–6 pairs of lance-ovate acute leaflets, a globular gland on the base of the petiole, and narrow linear smooth pods 5′ long. ①

C. obtusifòlia. From Illinois and Virginia S.; with 2 or 3 pairs of obovate leaflets, a pointed gland between the lowest, the pale flowers in pairs, and slender curved pods 6′–10′ long. ①

§ 2. *Low and spreading, smooth or roughish hairy herbs, in sandy or dry barren soil, with persistent striate stipules, and 10–20 pairs of small linear-oblong oblique or unequal-sided leaflets, which are somewhat sensitive, closing when roughly brushed; a cup-shaped gland below the lowest pair: flowers clustered in the axils.*

C. Chamæcrísta, LARGE-FL. SENSITIVE or PARTRIDGE PEA. Flowers pretty large, showy, on slender pedicels, with the petals often purple-spotted at base, a slender style, and 10 unequal stamens, some of the anthers usually yellow and others purple. Like the next most common S. ①

C. níctitans, SMALL-FL. S. Flowers small, on very short pedicels, with a short style, and 5 nearly equal anthers.

52. CÆSALPÍNIA. (Named for the early Italian botanist *Cæsalpinus*.) One species of tropical America, cult. in some conservatories, is planted out in Gulf States, viz.

C. pulchérrima (also named POINCIÀNA PULCHERRIMA), BARBADOES FLOWER-FENCE. Small tree, prickly, with twice-pinnate leaves, numerous oblong leaflets notched at the end, and open terminal racemes of large and showy flowers, the short-clawed broad and jagged-edged petals 1′ long and reddish-orange, and the crimson filaments 3′ long.

53. GYMNÓCLADUS, KENTUCKY COFFEE-TREE. (Name from Greek words for *naked branch*, the branches being very stout, and when the leaves have fallen appearing destitute of spray.)

G. Canadénsis. The only species, a fine ornamental and timber tree, wild from W. New York S. and especially W., with rough bark, twice-pinnate leaves 2° or 3° long, each partial leafstalk bearing 7–13 ovate and stalked leaflets, except the lowest pair, which are single leaflets (2′–3′ long); the leaflets

remarkable for hanging edgewise. Flowers in early summer; ripening in late autumn, the large and indurated pod 5′ – 10′ long and 1½′ – 2′ wide; the seeds over ½′ across.

54. GLEDÍTSCHIA, HONEY-LOCUST. (Named for the early German botanist, *Gleditsch*.) Fl. early summer, inconspicuous, ripening the pods late in autumn. Thorns simple or compound; those on the branchlets above the axils. Leaves on growing shoots of the season twice pinnate; those in clusters on spurs mostly once pinnate.

G. triacánthos, THREE-THORNED ACACIA or COMMON H. Wild in rich soil from Penn. S. & W., also commonly planted for shade, sometimes used for hedges: a rather tall tree, with light foliage, large often very compound thorns flattish at the base and tapering, small lance-oblong leaflets, and linear flat pods 9′ – 20′ long, often twisted or curved. A var. INÉRMIS has very few or no thorns.

G. Sinénsis, CHINESE H., occasionally planted, has stouter conical thorns, and broader oval leaflets.

G. monospérma, ONE-SEEDED or WATER H. Swamps from Illinois S. W.: small tree, with slender thorns, ovate or oblong leaflets, and oval 1-seeded pods, containing no pulp.

55. MIMÒSA, SENSITIVE-PLANT. (From Greek word *to mimic*, i. e. the movements imitating an animal faculty.) There are wild shrubby species in Texas and farther S. The following are herbs, procumbent or trailing, with bristly short pods.

M. pudica, COMMON S. Beset with spreading bristly hairs and somewhat prickly; the leaves very sensitive to the touch, of very numerous linear leaflets on 2 pairs of branches of the common petiole, crowded on its apex, so as to appear digitate; flowers rose-purple, in slender-peduncled heads, in summer. Cult. from South America. ①

M. strigillòsa, WILD S. Rough with appressed stiff bristles, not prickly; leaves with 5 or 6 pairs of branches of the common petiole, each bearing 10 – 14 pairs of oblong-linear leaflets; flowers rose-color; oblong head on very long peduncle. Wild on river-banks far S.; fl. summer. ♃

56. SCHRÁNKIA, SENSITIVE-BRIER. (Named for a German botanist, *Schrank*.) Two species wild in dry sandy soil, S. & W., spreading on the ground, appearing much alike, with leaves closing like the Sensitive-Plant, but only under ruder handling: flowers rose-purple, small, in globular heads on axillary peduncles, in summer. ♃

S. uncinàta. Stems, petioles, peduncles, and oblong-linear short-pointed pods beset with rather stout hooked prickles; leaflets elliptical, reticulated with strong veins underneath.

S. angustàta. Prickles scattered, weaker, and less hooked; leaflets oblong-linear, not reticulated; pods slender, taper-pointed.

57. DESMÁNTHUS. (Greek-made name, meaning that the flowers are *bound together*: they are merely crowded in a head. A few species very far S., and the following W.

D. brachýlobus. Prairies from Illinois S. & W.: nearly smooth, 1° – 4° high, erect, with 6 – 15 pairs of partial petioles, each bearing 20 – 30 pairs of *very small narrow leaflets, one or more glands on the main petiole, small heads* of whitish flowers, followed by short 2 – 6-seeded pods; stamens 5. ♃

58. ALBÍZZIA, SILK-FLOWER. (Named for an Italian botanist.)

A. Julibríssin, SILK-FLOWER or SILK-TREE, from Asia, planted for ornament S.: a small tree, with leaves of numerous pairs of partial petioles, each bearing about 60 oblong acute leaflets, which appear as if halved, and with panicled heads of rather large pale rose-purple flowers, the long and lustrous filaments, like silky threads in tufts (giving the popular name), being mainly conspicuous; pod 5′ – 6′ long, oblong-linear, very flat and thin.

59. ACÀCIA. (Ancient Greek and Latin name of Acacia-trees; one species yields Gum Arabic.) No native species north of Texas. The following are exotic shrubs or trees, cult. in conservatories N., and one of them planted or run wild far S.

§ 1. *Leaves twice pinnate, of very numerous small leaflets.*

A. Farnesiàna. Native of South America: nat. along the Gulf of Mexico, sometimes cult.: a nearly smooth shrub, with pairs of short prickles along the branches, small linear leaflets, small heads, on short peduncles (2 or 3 together) of yellow very sweet-scented flowers, used by the perfumers. The plant also yields gum. Pod thick, pulpy or pithy within.

A. dealbàta, of Australia: a fast-growing small tree, not prickly nor thorny, pale or whitened with minute obscure down or meafiness; with leaves of 10 – 25 pairs of partial petioles (a little gland on the main petiole between each pair), and very many pairs of closely set and minute linear leaflets; the bright yellow flowers in globular heads collected in an ample very open raceme or panicle, odorous.

§ 2. *Only the leaves of the seedling twice-pinnate; the rest simple and entire mostly blade-like petioles (called phyllodia, Lessons, p. 69), standing edgewise instead of flatwise, but otherwise imitating rigid simple leaves. Chiefly natives of Australia, where they are extremely numerous.*

* *Leaves short, and with only a central nerve or midrib,*

+ *Linear awl-shaped or almost needle-shaped, prickly-tipped, small, about ½′ long.*

A. juniperina. Rigid bushy shrub, with the leaves scattered over the branches, and flowers in single small round heads.

A. verticillàta. Spreading shrub or low tree, with the leaves crowded more or less in whorls of 5 – 8 or more, and flowers in cylindrical spikes.

+ + *Obliquely oblong, lanceolate, or broader, not prickly-tipped.*

A. armàta. Tall-growing shrub, usually with hairy branches, and with conspicuous prickle-like stipules; half-ovate oblong or incurved-lanceolate leaves mostly blunt, with somewhat wavy margins, feather-veined, not over 1′ long; flowers in round heads.

A. vestita. Tall-growing shrub, soft-downy, with drooping branches, pale obliquely wedge-ovate or obovate and curved bristle-pointed leaves, and small globular heads of flowers in racemes.

A. cultrifórmis. Shrub smooth, mealy-glaucous when young, with triangular or lance-obovate and curved minutely pointed leaves, of thick and firm texture, and globular heads in racemes, forming a leafy terminal panicle.

* * *Leaves 3′ – 6′ or more long, pointless, with 2 – 5 parallel nerves, or when very narrow only 1-nerved: flowers in slender loose or interrupted axillary spikes.*

A. longifòlia. Shrub or small tree, smooth, with angular branches, and leaves varying from lance-oblong to linear, greatly varying, 2 – 5-nerved, often faintly veiny between the nerves.

A. lineàris. Like the preceding, but with leaves (4′ – 10′ long) very narrow-linear and with only one obvious nerve.

38. ROSACEÆ, ROSE FAMILY.

Plants with alternate stipulate leaves and regular flowers, with usually indefinite unconnected stamens inserted on the calyx, one, few, or many simple separate pistils (except in the division to which the Pear belongs), and single, few, or occasionally numerous seeds; these filled with a straight embryo. Destitute of noxious qualities (excepting the bark, leaves, and kernels of some Cherries, and the like), and furnishing the most important fruits of temperate climates, as well as the queen of flowers. We have three principal great divisions.

I. ALMOND or PLUM FAMILY: consists of trees or shrubs, with simple leaves, stipules free from the petiole (often minute or early deciduous, so that there may appear to be none), a calyx which is deciduous after flowering, and a single pistil, its ovary tipped with a slender style (Lessons, p. 103, fig. 213), containing a pair of ovules, and becoming a simple drupe or stone fruit. (Lessons, p. 128, fig. 285.)

1. PRUNUS. Calyx with a bell-shaped or urn-shaped tube and 5 spreading lobes. *Petals 5, and stamens 3 – 5 times as many, or indefinitely numerous, inserted* on the throat of the calyx. Flowers white or rose-color.

II. ROSE FAMILY PROPER: consists of herbs or shrubs, with stipules either free from or united with the base of the petiole, calyx persisting below or around the fruit, which is composed of sometimes one but commonly several or many distinct pistils.

§ 1. *Calyx not with a fleshy tube or cup, nor closed over the fruit.*

* *Ovaries about* 5 (2 – 12), *becoming little pods, several-* (2 – 10-) *seeded: calyx with only* 5 *or rarely* 4 *lobes.*

2. SPIRÆA. Shrubs or perennial herbs, with stipules sometimes minute or obsolete, sometimes conspicuous, and white or rose-purple flowers. Calyx open and short, mostly 5-cleft, not enclosing the pods. Petals equal, commonly broad. Stamens 10 – 50.

3. GILLENIA. Herbs, with nearly white flowers and almost sessile leaves of 3 leaflets. Calyx narrow, oblong, 5-toothed, enclosing the 5 pistils (which at *first lightly cohere in a mass*) and the little pods. Petals rather unequal, lance-linear. Stamens 10 – 20, not projecting.

* * *Ovaries few or many, single-ovuled, becoming dry akenes in fruit above the open and mostly spreading calyx: stamens numerous.*

+ *Pistils few, only* 2 – 8.

4. KERRIA. Shrub, with long green branches, simple and coarsely-toothed leaves, and yellow flowers terminating the branchlets of the season. Calyx with 5 somewhat toothed large lobes. Petals broad.

5. WALDSTEINIA. Low perennial herbs, with chiefly root-leaves, either lobed or compound, and a few yellow flowers on a short scape. Calyx with a top-shaped tube and 5 spreading lobes, alternate with which are sometimes 5 minute teeth or bractlets. Petals obovate. Styles deciduous by a joint.

+ + *Pistils numerous and heaped in a head: calyx* (*except in one* Geum) *augmented with additional outer lobes or bractlets alternating with the* 5 *proper lobes: leaves mostly compound.*

6. GEUM. Perennial herbs. Calyx with a bell-shaped, top-shaped, or hemispherical tube or cup. Akenes narrow, or tapering to the base, tipped with the *long persistent style, or the greater portion of it, in the form of a naked or* hairy tail. Seed erect. Receptacle dry, conical or cylindrical.

7. POTENTILLA. Herbs, or one species shrubby. Calyx flat or widely open. Akenes small, on a dry receptacle, from which they at length fall.

8. FRAGARIA. Perennial low or stemless herbs, with runners; and leaves of 3 leaflets. Calyx open, flat. Styles short and lateral. Akenes naked, small, on the surface of an enlarged pulpy edible receptacle. (Lessons, p. 125, fig. 279, and p. 129, fig. 288.)

* * * *Ovaries several or many, 2-ovuled, in fruit becoming fleshy or pulpy and 1-seeded, forming a head or cluster above the flat or widely open simply 5-cleft calyx: stamens numerous: styles short, naked, at length falling off.*

9. DALIBARDA. Very low perennial tufted herb, with simple rounded-heart-shaped or kidney-shaped root-leaves and 1 – 2-flowered scapes. Calyx of 5 or even 6 unequal sepals. Ovaries 5 – 10, in fruit merely fleshy, becoming almost dry and bony.

10. RUBUS. Perennial herbs or shrubby plants. Ovaries numerous, in fruit pulpy (berry-like, or more properly drupe-like, the inner hard part answering to the stone of a cherry or peach on a small scale), crowded on the dry or fleshy receptacle. (Lessons, p. 129, fig. 289, 290.)

§ 2. *Calyx with an urn-shaped dry tube, contracted or nearly closed at the mouth, and enclosing 1 – 4 little pistils which become akenes. Flowers small: petals none except in* Agrimonia.

11. ALCHEMILLA. Low herbs, with palmately lobed or compound leaves, and minute greenish flowers in clusters or corymbs. Calyx with 4 inner and 4 outer or accessory spreading lobes. Petals none. Stamens 1 – 4. Pistils 1 – 4, with lateral styles.

12. AGRIMONIA. Herbs, with interruptedly pinnate leaves, and flowers in slender terminal spikes or racemes. Calyx with the top-shaped tube beset with hooked bristles just below the 5 green lobes, the latter closing together in fruit. Petals 5, commonly yellow, broad and spreading. Stamens 5 – 15. Pistils 2: styles terminal.

13. POTERIUM. Herbs, with odd-pinnate leaves, and white, purple, or greenish flowers (sometimes diœcious) in dense heads or spikes on long erect peduncles. Calyx with a short 4-angled closed tube, surmounted by 4 broad and petal-like at length deciduous lobes. Petals none. Stamens 4 – 12 or more, with long and slender projecting filaments. Pistils 1 – 4: the terminal styles tipped with a brush-like or tufted stigma.

§ 3. *Calyx with an urn-shaped or globose fleshy tube, contracted at the mouth, enclosing the many pistils and akenes. Flowers large and showy.*

14. ROSA. Shrubby, mostly prickly, with pinnate leaves, of 3 – 9 or rarely more serrate leaflets, stipules united with the base of the petiole, and flowers single or in corymbs terminating leafy branches. Calyx with 5 sometimes leafy lobes which are often unequal and some of them toothed or pinnately lobed. Petals 5, or more in cultivation, broad, inserted along with the many stamens at the mouth of the calyx-tube. Pistils numerous, with terminal styles, and one-ovuled ovaries, becoming hard or bony akenes, enclosed in the tube or cup of the calyx, which in fruit becomes pulpy and imitates a berry or pome. (Lessons, p. 125, fig. 280.)

III. PEAR FAMILY: consists of shrubs or trees, with stipules free from the petiole (often minute or early deciduous); the thick-walled calyx-tube becoming fleshy or pulpy and consolidated with the 2 – 5 ovaries to form a compound pistil and the kind of fruit called a pome. (Lessons, p. 104, fig. 215.) Lobes of the calyx and petals 5. Stamens numerous, or rarely only 10 – 15.

* *Fruit drupe-like; the seeds solitary in a hard stone or stones.*

15. CRATÆGUS. Trees or shrubs, mostly with thorny branches and flowers in corymbs or cymes, or sometimes solitary, terminating the branchlets; the leaves lobed or serrate. Styles 2 – 5 (or rarely 1): ovary of as many 2-ovuled cells. Fruit with a stone of 2 – 5 (rarely single) 1-seeded cells or carpels, more or less cohering with each other.

16. COTONEASTER. Shrubs (exotic), usually low, with the small coriaceous leaves entire and whitish-downy underneath, small clustered flowers, and the calyx white-woolly outside. Styles 2 – 5. Fruit small, the pulpy calyx-tube containing 2 – 5 little seed-like hard stones.

* * *Fruit with thin and cartilaginous or papery 2 – several-seeded carpels in the pome.*

+ *Leaves persistent.*

17. PHOTINIA. Trees or shrubs (exotic), not thorny, with ample evergreen leaves. Flowers corymbed. Styles 2 – 5, dilated at the apex. Fruit berry-like, the 2 – 5 partitions thin, or vanishing.

+ + *Leaves deciduous.*

18. AMELANCHIER. Trees or shrubs, not thorny, with simple leaves, racemed flowers, and narrow white petals. Styles 5, united below. Ovary of 5 two-ovuled cells, but each cell soon divided more or less by a projection or growth from its back, making the berry-like fruit 10-celled.

19. PYRUS. Trees or shrubs, sometimes rather thorny, with various foliage, and flowers in cymes, corymbs, or rarely solitary. Styles 2 – 5. Ovary of 2 – 5 two-ovuled (or in cultivated species several-ovuled) cells, which are thin and papery or cartilaginous in fruit in the fleshy or pulpy calyx-tube.

20. CYDONIA. Trees or shrubs, with entire or merely serrate leaves, and rather large flowers, which resemble those of Pyrus, as does the fruit, only the 5 cells are many-ovuled and many-seeded.

1. **PRUNUS,** PLUM, &c. (The ancient Latin name of the Plum.) As now received, this genus comprises all the following groups, which it has been found impracticable to keep up as botanical genera. Foliage and the stone and kernel of the fruit usually with the flavor of prussic acid, especially in the Peach and Cherries.

§ 1. ALMOND and PEACH. *Flowers almost sessile, from separate scaly buds, in spring, before the leaves, the latter folded together lengthwise (conduplicate) in the bud: fruit velvety, large: the stone with wrinkles and holes.*

P. (Amýgdalus) nàna, DWARF or FLOWERING ALMOND. Cult. for ornament, from Asia; a low shrub, with abundant and handsome rose-colored (or by variation white) usually full-double flowers, earlier than the long and narrow smooth leaves; calyx-tube short-cylindrical; fruit dry when ripe, with the outer part separating as a husk from the brittle stone, as in the edible Almond.

P. (A.) Pérsica, PEACH. Cult. from Asia for the fruit, also a double-fl. variety, for ornament; small tree, with purplish-rose-colored flowers, bell-shaped calyx-tube, lanceolate leaves, and globular fruit ripening a thick pulp, either clinging to or separable from the rough-wrinkled porous stone. Unknown in a wild state, probably derived from the COMMON ALMOND, P. (A.) COMMÙNIS. — Var. **lǽvis,** the NECTARINE, is a state with a smooth-skinned fruit.

§ 2. APRICOT. *Flowers short-pedicelled or almost sessile, from separate scaly buds, in early spring, before the leaves, which are rolled up (convolute) in the bud: drupe velvety, but with a smooth stone having grooved margins, one of them sharp-edged.*

P. Armeniaca, APRICOT. Cult. from Armenia; a low smooth tree, with ovate and mostly rather heart-shaped leaves, white or slightly rosy flowers solitary or in pairs, and early-ripening fruit, of character intermediate between peach and plum.

§ 3. PLUM and CHERRY. *Flowers pedicelled and almost always white: drupe smooth, its stone smooth or somewhat rugged.*

* PLUMS. *Flowers from separate lateral buds, in spring, preceding or coetaneous with the leaves; the latter rolled up, or in most of our native species folded together, in the bud: drupe generally with a whitish bloom and a flat or flattish stone.*

+ *Exotic (European or Asiatic) species.*

P. doméstica, GARDEN PLUM, of many varieties: tree with spreading thornless branches, and oblong or lance-ovate leaves; the fruit very various in size and shape, with a flat or flattish and roughish stone. Doubtless (at least in part) a long-cultivated derivative of

P. insitítia, BULLACE PLUM, introduced in some places near the seaboard, has been used as a stock for grafting, &c., is a little thorny, the pedicels and lower face of the leaves downy, the fruit round and black.

P. spinòsa, SLOE, or BLACK THORN. Cult. or nat. in old gardens or waste places: a low tree, with spreading thorny branches; the obovate-oblong or lance-oblong leaves and pedicels soon glabrous; fruit small, globular, purple-black, with a turgid stone and a greenish astringent pulp. Probably this is the original of the Bullace.

+ + *Native species of the country, but two of them have been planted for the fruit. They are manifestly Plums rather than Cherries, although the last is ambiguous as to the fruit, only the Beach Plum has an obvious bloom on the fruit, and all have the leaves folded in the bud.*

P. marítima, BEACH PLUM. Sea-beaches and sandy soil near the coast; a scarcely thorny shrub, 2° – 5° high, with the ovate or oval finely serrate leaves soft-downy underneath, short and downy pedicels, and globular purple or crimson fruit with a bloom (½' – 1' long), rather pleasant-tasted, sometimes used for preserving.

P. Americàna, WILD RED and YELLOW PLUM. Along streams through the country; occasionally planted; a tall shrub or small tree, often thorny,

with the oval or obovate and pointed leaves thin, very veiny, coarsely or doubly serrate, smooth when old; the globular or oval fruit ($\frac{1}{2}' - \frac{3}{4}'$ in diameter) yellow with some red, orange, or crimson, with a pleasant juice but a tough acerb skin, the stone sharp-edged or margined.

P. Chicàsa, Chickasaw Plum. Planted or run wild from Penn. S. & W., native S. W., $6° - 12°$ high, somewhat thorny, with long and narrow almost lanceolate acute leaves, edged with very fine teeth, a globular red fruit ($\frac{1}{2}' - \frac{3}{4}'$ in diameter) of pleasant flavor, thin-skinned, and containing a marginless almost globular stone.

* * Cherries *of the Garden-Cherry sort, i. e. with flowers in sessile umbels from separate lateral buds, in spring, with or rather preceding the leaves, which are folded together lengthwise in the bud.*

P. Cérasus, Garden Red Cherry. Cult. from Eu.; a tree $10° - 30°$ high, with slender spreading branches, obovate and lance-ovate serrate leaves, rather large flowers on shortish pedicels and somewhat preceding the leaves, and an acid red globose fruit. The Morello Cherry *is a variety with dark* purple more astringent fruit. Probably derived from, or now sometimes mixed with the next.

P. àvium, Bird Cherry of Eu., English Cherry. Cult. from E.; making a larger tree than the preceding, with ascending branches, softer and coarsely or doubly toothed more pointed leaves, usually pubescent beneath, the flowers developed at the same time with the leaves, and the round-ovoid or somewhat heart-shaped fruit sweet or bitterish-sweet (not acid), of various colors. Double-flowered varieties are cult. for ornament.

P. Pennsylvànica, Wild Red Cherry. Rocky woods N. Small tree, with light red-brown bark, oblong-lanceolate and pointed leaves smooth *and green both sides, their margins finely and sharply serrate, small flowers on* long pedicels, and light red sour fruit not larger than peas.

P. pùmila, Dwarf Cherry. Rocks or sandy banks N. Shrub spreading or forming broad tufts on the ground, seldom rising 2°; leaves spatulate-lanceolate, pale beneath, toothed only towards the apex; flowers 2-4 together; fruit ovoid, dark red, with stone as large as a pea.

* * * Cherries *of small size, with flowers in racemes,*

+ *In late spring or early summer, terminating leafy shoots of the season.*

P. serótina, Wild Black Cherry. Tree or shrub, westward becoming a good-sized forest tree, with bitter aromatic bark, close-grained reddish wood valued by the cabinet-maker; *the oblong or lance-oblong smooth leaves of thick*ish or firm texture, usually taper-pointed, serrate with incurved short callous teeth; flowers in long racemes, considerably later than the next; purplish-black bitterish vinous fruit ripening in autumn.

P. Virginiàna, Choke Cherry. Tall shrub or small tree, with grayish bark, oval-oblong or obovate and abruptly pointed thin leaves very sharply serrate with slender projecting teeth; flowers in shorter and closer racemes, in spring; the fruit ripe in summer, red turning dark crimson, astringent, but eatable when fully ripe, the stone smooth.

P. Pàdus, Small Bird-Cherry of Eu., is occasionally planted; resembles the last, has longer and looser often drooping racemes, and a roughened stone.

+ + *Erect racemes in early spring, from the axils of evergreen leaves.*

P. Caroliniàna, Carolina Laurel-Cherry, also called Mock Orange at the South, probably from the coriaceous smooth and glossy leaves, which are lance-ovate or oblong, entire or with a few sharp and appressed teeth, longer than the racemes, the calyx as well as petals white; small fruit black and bitter, becoming dry. Ornamental small tree; the leaves said to be poisonous to cattle.

P. Lauro-Cérasus, Laurel-Cherry of Europe, from Asia Minor, and

P. Lusitánica, Portugal L., from Portugal and the Azores, beautiful evergreen shrubs or small trees, used for hedges and screens in England, are not hardy N., but would stand south of Penn. Their leaves and kernels are strongly imbued with the prussic-acid or bitter-almond flavor.

2. SPIRÆA, MEADOW-SWEET, &c. (Greek name of some shrub, of the flowering branches of which garlands were made.) All hardy shrubs or perennial herbs: fl. late spring and summer.)

§ 1. *Shrubs, with simple leaves.*

* *Native species: but the last common in gardens, the first occasionally planted.*

S. opulifòlia, NINE-BARK; so-called from the loose bark, separating in thin annual layers from the stems: a tall shrub, with long recurving branches, the roundish and mostly heart-shaped leaves partly 3-lobed and cut-toothed, white flowers (of no beauty) in umbel-like corymbs, the pods large for this genus, bladdery, and commonly turning purplish. Wild on rocky banks, from New York W. & S.

S. corymbòsa. From S. Penn. S., not common: shrub 1° – 2° high, smooth, with oval leaves cut-toothed towards the apex, and white flowers in a flat compound corymb.

S. tomentòsa, HARDHACK or STEEPLEBUSH. Common E. in low grounds; 2° – 3° high, hoary-downy, except the upper face of the ovate or oblong serrate small leaves, the rose-purple or white flowers crowded in a very dense terminal panicle; pistils downy.

S. salicifòlia, COMMON MEADOW-SWEET. Common in wet grounds, also in old gardens: shrub 2° – 3° high, bushy, smooth, with wedge-lanceolate or oblong leaves simply or doubly serrate, and white or barely flesh-colored flowers in a crowded panicle.

* * *Cultivated for ornament, exotic or W. North American.*

+ *Flowers in close or spike-like clusters collected in a close and narrow or spike-like terminal panicle, pink-purple.*

S. Douglàsii, DOUGLAS'S MEADOW-SWEET. Cult. from Oregon and *California: resembles our wild Hardhack (S. tomentosa), but has longer usually lance-oblong and very blunt leaves* rather whiter beneath, and deeper pink flowers with smooth pistils.

+ + *Flowers in compound corymbs or broad panicles.*

S. callòsa (also named S. FORTUNEI), from *Japan*: shrub 3° – 6° high, smoothish, with lance-oblong and taper-pointed unequally and very sharply serrate leaves, branches terminated by clustered dense corymbs or cymes of deep pink flowers, 10 glands at the mouth of the calyx, the pistils smooth.

S. ariæfòlia. *Tall shrub from Oregon, with slender branches, terminated* by a very large and light or drooping decompound panicle of small yellowish-white flowers; the leaves roundish-ovate, very obtuse, thin, cut on each side into 4 or 5 blunt and toothed lobes, sometimes almost pinnatifid, soft downy, at least beneath.

+ + + *Flowers in simple, often umbel-like corymbs terminating leafy shoots of the season: natives of Europe and Asia: petals white except the first species.*

S. bélla, *from Nepal: a low shrub, with ovate acute and merely sharply* serrate leaves whitish-downy beneath, the simple corymb, sometimes clustered, and rose-pink flowers.

S. chamædrifòlia, from E. Europe and Siberia; a spreading low bush, smooth, with ovate or oblong usually blunt and cut-toothed leaves, at least towards the summit, and rather small flowers in simple corymbs.

S. trilobàta, from Siberia; a spreading smooth bush, with rounded crenately cut and 3-lobed leaves and rather showy flowers.

S. lanceolàta, or REEVESIÀNA, from China, has oblong, lance-oblong, or some three-cleft serrate-toothed leaves, and showy flowers.

S. hypericifòlia, ITALIAN MAY, or ST. PETER'S WREATH. Shrub 3° – 6° high, smooth or smoothish, with long recurved branches, and very small wedge-oblong leaves, a little crenate or lobed at the end; flowers small, white, in small sessile umbels.

+ + + + *Flowers in simple sessile umbels along the slender branches of the preceding year, subtended only by greenish bud-scales or imperfect leaves, rather earlier than the proper leaves, in spring.*

S. prunifòlia, from Japan: slender shrub, with small ovate finely and sharply serrate leaves, smooth above, often minutely downy beneath; the form cultivated has full-double pure white blossoms, ½′ in diameter, produced in great abundance.

§ 2. *Shrubby, with pinnate leaves.*

S. sorbifòlia. Cult. from Siberia, very hardy, 3° – 4° high, with leaves (as the name denotes) resembling those of the Mountain-Ash, of 17 – 21 lanceolate taper-pointed doubly and sharply serrate leaflets, and white flowers in an ample terminal panicle, the narrow pods a little cohering.

§ 3. *Herbs, with thrice pinnately-compound leaves, no stipules, and diœcious flowers.*

S. Arúncus, GOATSBEARD. Rich woods from New York S. & W., also in some gardens: *smooth, 3° – 5° high; with lance-oblong or lance-ovate taper-*pointed leaflets sharply serrate and cut, and yellowish-white very small flowers in great numbers, crowded in slender spikes which are collected in a great compound panicle; petals narrow; pedicels reflexed in fruit.

§ 4. *Herbs, with interruptedly pinnate leaves, conspicuous stipules, perfect flowers, reflexed sepals and petals sometimes 4, and 5 – 12 little 1 – 3-seeded pods.*

S. Filipéndula, DROPWORT. Cult. from Europe: some of the coarse long fibrous roots swollen at the lower end into oblong tubers; herbage smooth and green; leaves chiefly from or near the ground, with many oval or lanceolate leaflets deeply toothed, cut, or pinnately cleft, and gradually diminishing in size downwards; the nearly naked stems 1° – 2° high, bearing a compound terminal cyme of white or rosy-tipped flowers, one variety full-double.

S. Ulmària, ENGLISH MEADOW-SWEET. Cult. from Europe; 1° – 3° high, nearly smooth, except the lower surface of the lyrate and interruptedly pinnate leaves which is minutely white-downy; the yellowish-white small and sweet-scented flowers very numerous and crowded in a compound cyme at the naked summit of the stems; little pods twisting spirally.

S. lobàta, QUEEN-OF-THE-PRAIRIE. Wild in meadows and prairies W., also cult.: smooth and green; the leaves mostly from or near the ground; the end leaflet very large, 7 – 9-parted, and its lobes cut-toothed; stems 2° – 5° or even 8° high, bearing an ample and panicled compound cyme crowded with the handsome peach-blossom-colored flowers. Bruised foliage exhales the odor of Sweet Birch.

3. GILLÈNIA, INDIAN PHYSIC, AMERICAN IPECAC. (Named for a *Dr. Gillen* or *Gillenius*.) Fl. summer. ♃

G. trifoliàta, COMMON I. or BOWMAN'S-ROOT. Rich woods, from New York S. & W.; smooth, branching, 2° high, with the 3 ovate-oblong pointed leaflets cut-toothed, entire stipules small and slender, and rather pretty white or scarcely rosy-tinged flowers loosely panicled on the slender branches.

G. stipulàcea, LARGE-STIPULED I. or AMERICAN IPECAC. Open woods, W.: *has the lanceolate leaflets and leaf-like stipules deeply cut and toothed*: otherwise like the other.

4. KÉRRIA. (Named for *Bellenden Ker*, a British botanist.)

K. Japónica, CORCHORUS, so-called, of the gardens, from Japan: a familiar, smooth, ornamental shrubby plant, 4° – 8° high, with lance-ovate thin leaves, and handsome yellow flowers, in summer, usually full-double; — the natural state, with 5 petals and numerous stamens only recently introduced and rare.

5. WALDSTEINIA. (Named for *F. von Waldstein*, an Austrian botanist.)

W. fragarioides, BARREN STRAWBERRY. Wooded banks, chiefly N.; in aspect and especially in the 3 broadly wedge-shaped leaflets resembles a Strawberry-plant (as the specific and the popular names denote), but is smoothish and yellow-flowered: in summer. ♃

6. GÈUM, AVENS. (From Greek word, meaning to give an agreeable flavor; the roots of some species somewhat scented.) Several wild species, only the following common: fl. late spring and summer. ♃

G. rivàle, PURPLE or WATER AVENS. In bogs and low grounds N.: thickish rootstock (sometimes used in medicine as an astringent) sending up lyrately and interruptedly pinnate leaves, and rather naked several-flowered stems (2° high); the flowers pretty large, nodding, with purplish-orange and broadly obovate or obcordate petals narrowed at the base, never spreading; in fruit the head of akenes erect, stalked in the persistent calyx, the persistent styles jointed and bent in the middle, the upper part plumose-hairy.

G. vérnum, SPRING A. Thickets, from Ohio to Illinois and Kentucky: slender, 2° – 3° high; root-leaves rounded heart-shaped and 3 – 5-lobed, or some of them pinnate and cut; flowers small, with yellow petals about the length of the simply 5-lobed calyx; the head of fruit raised above the calyx on a conspicuous stalk; the styles, &c. smooth, the upper joint falling off.

G. stríctum, FIELD A. Moist grounds and fields: a coarse herb, 3° – 5° high, rather hairy, with root-leaves interruptedly pinnate and the leaflets wedge-obovate, those of the stem with 3 – 5 narrower leaflets; in summer bearing panicled flowers with broadly obovate golden-yellow petals exceeding the calyx; stipules large, deeply cut; head of fruit close in the calyx; the persistent naked style hooked at the end after the short upper joint falls; receptacle downy.

G. Virginiànum, WHITE A. Thickets and border of woods: coarse and bristly-hairy herb 1° – 3° high, with root and lower leaves of several pinnate leaflets, the upper 3-parted and cut; the panicled flowers small, with inconspicuous greenish-white petals shorter than the calyx; head of fruit like the last, but its receptacle smooth.

G. álbum, WHITE A. Grows in similar places with the preceding, and like it, but smooth or soft-pubescent, with root-leaves of 3 – 5 leaflets, or some of them rounded and simple except a few minute leaflets below; the petals as long as the calyx, white or pale greenish-yellow; receptacle of fruit bristly.

7. POTENTÍLLA, CINQUEFOIL, FIVE-FINGER. (Name from *potens*, powerful, from reputed medicinal virtues, but these plants are merely mild astringents.) Wild plants of the country, except those of the last section, and one yellow one: but the *Shrubby Cinquefoil* is also planted.

§ 1. *Petals pale yellow, small, not surpassing the calyx.* ① ②

P. Norvègica, NORWAY C. An erect, hairy, weedy plant, 1° – 2° high, branching above, with only 3 obovate-oblong and cut-toothed leaflets: fl. summer, in fields.

P. paradóxa. A spreading or procumbent, pubescent, weedy plant, on river-banks W., with pinnate leaves of 5 – 9 obovate-oblong cut-toothed leaflets, and akenes with a thick appendage at their base: fl. summer.

§ 2. *Petals whitish or cream-color, broad, surpassing the calyx: akenes smooth.* ♃

P. argùta. A stout, erect, brownish-hairy, coarse plant, 1° – 4° high, rather clammy above, on rocky hills N. & W., with pinnate leaves of 3 – 9 oval or ovate cut-toothed leaflets soft-downy beneath, and a close terminal cluster of rather large flowers, of no beauty, in summer.

§ 3. *Petals bright yellow, larger than the lobes of the calyx.* ♃

* *Leaves of 5 digitate leaflets.*

P. récta. Cult. in some old gardens, from Eu.: a coarse, erect, hairy plant, 2° – 3° high, with sometimes 7 narrowly wedge-oblong leaflets coarsely toothed, and rather large cymose flowers.

P. Canadénsis, COMMON WILD C. or FIVE-FINGER. Open dry ground: dwarf, silky-hairy, with wedge-obovate leaflets, and axillary 1-flowered peduncles; flowering from early spring to midsummer, and spreading by runners.

VAR. **simplex,** in moister or richer soil, usually well marked by its greater size and greener foliage; the stems 1° – 2° long, ascending or spreading from a short tuberous rootstock; leaflets more oblong; flowers produced through the summer.

P. argéntea, Silvery C. Dry fields, banks, and roadsides N.: a low, spreading or prostrate, much branched, white-woolly weed, with wedge-oblong cut-pinnatifid leaflets green above, white with silvery wool beneath, and the margins revolute; the small flowers somewhat panicled, all summer.

* * *Leaves pinnate: receptacle and partly the akenes white-hairy.*

P. Ansèrina, Silver-Weed. Wet banks and shores, N. & W.: leaves all from the root or in tufts on the long slender runners, green above, silvery with silky down beneath, of 9–19 oblong cut-toothed principal leaflets and some pairs of minute ones intermixed; stipules conspicuous and many-cleft; flowers solitary on long scape-like peduncles, all summer.

P. fruticòsa, Shrubby C. Wet grounds N.: 2°–4° high, woody, silky, very much branched, with 5 or 7 crowded oblong-lanceolate entire leaflets, scale-like stipules, and loose clusters of rather showy flowers, all summer.

§ 4. *Petals white: akenes and receptacle hairy: leaflets only 3, digitate.* ♃

P. tridentàta, Three-toothed C. Coast of N. England N. and on mountains: 4′–6′ high, tufted, spreading, with 3 thickish nearly smooth leaflets coarsely 3-toothed at the end, and several flowers in a cyme, in early summer.

§ 5. *Petals purple, rose-color, or crimson: akenes smooth.* ♃

* *Wild in wet and cold bogs N.: petals narrow, shorter than the calyx.*

P. palústris, Marsh Five-finger. Stems ascending from an almost woody creeping base; leaves pinnate, of 5–7 lance-oblong serrate and crowded leaflets, whitish beneath; flowers in a small cyme, the calyx nearly 1′ broad, the inside as well as the petals dull dark purple; receptacle becoming large and spongy: fl. all summer.

* * *From Himalaya, cult. for ornament: petals broad and large, obcordate.*

P. Nepalénsis, Nepal C. Leaflets 3 in the upper, 5 in the lowest leaves, digitate, hairy but green both sides, wedge-oblong, coarsely toothed; flowers rose-red, all summer. P. Hopwoodiàna, with flesh-colored flowers, is a garden hybrid of this and P. recta.

P. atrosanguínea, Dark Nepal C., is soft silky-hairy, with 3 leaflets to all the leaves, and much darker-colored flowers than in the preceding, brown-purple or crimson.

8. FRAGÀRIA, STRAWBERRY. (Name from *fraga*, the old Latin name of the strawberry.) ♃

§ 1. True Strawberries. *Petals white: receptacle of the fruit high-flavored: scapes several-flowered: runners naked. Fl. in spring and early summer, those of all but the first species inclined more or less to be diœcious. In cultivation the species are considerably mixed by crossing.*

F. vésca, Common S. of Europe, yields the Alpine, Perpetual, &c., plentifully native N.; is mostly slender, with thin dull leaflets strongly marked by the veins, calyx remaining open or reflexed after flowering, small ovoid-conical or elongated fruit high-scented, and the akenes superficial.

F. elàtior, Hautbois S., of Europe, sometimes cult.; is taller and quite diœcious, with the calyx strongly reflexed away from the fruit, which is dull reddish and musky-scented.

F. Virginiàna, Virginian Wild S., original of the American Scarlet, &c.; has leaflets of firm texture, their smooth and often shining upper surface with sunken veins, calyx becoming erect after flowering and closing over the hairy receptacle when unfructified; fruit with a narrow neck, mostly globular, its surface with deep pits in which the akenes are sunken.

Var. **Illinoénsis,** perhaps a distinct species, is coarser and larger, grows in richer soil, from W. New York W. & S., the hairs of the scape, &c. shaggy, is the supposed original of Hovey's Seedling, Boston Pine, &c.

F. Chilénsis, native of Pacific coast from Oregon S.; its varieties and crosses with the foregoing have given rise to the Pine-apple S. and the like: a large and robust species, with very firm and thick leaflets soft-silky beneath or on both faces, and a hairy receptacle, the large rose-colored fruit erect in the pure state (instead of hanging), ripening late.

§ 2. *Petals yellow: receptacle tasteless: runners bearing leaves and 1-flowered peduncles: calyx with 5 external pieces very large, leaf-like, and 3-lobed.*

F. Índica, Indian S., of Upper India, &c.: cult., running wild S. E., rather handsome both in flower and (red) fruit, which are produced all summer and autumn.

9. DALIBÁRDA. (Named for *Dalibard*, an early botanist of Paris.) ♃

D. rèpens, of wooded slopes N., is a low, stemless, tufted, downy little plant, spreading more or less by subterranean runners, with the aspect of a Violet, the scapes bearing one or two delicate white flowers, in summer.

10. RÙBUS, BRAMBLE, &c. (The Roman name, connected with *ruber*, red.) ♃

§ 1. Flowering Raspberries, *with simple leaves and broad flattish fruit, the very small and numerous reddish or amber-colored grains at length separating from the persistent receptacle.*

R. odoràtus, Purple F. Dells, &c., N.: shrubby, 3° – 5° high, clammy-bristly and odorous, not prickly; with ample 3 – 5-lobed leaves, the lobes pointed and the middle one longest, peduncles many-flowered, calyx-lobes with long slender tips, and petals purple-rose-color; the showy flowers 1′ – 2′ across, produced all summer.

R. Nutkànus, White F. From Upper Michigan to Pacific, and cult.: like the other, but less bristly and clammy, with leaves more equally 5-lobed and coarsely toothed, and fewer flowers with narrower white petals.

§ 2. True Raspberries, *with 3 – 5 leaflets, the fruit falling when ripe from the then dry narrow receptacle: flowers with small white erect petals, in early summer, on leafy shoots of the season which (in all but the first) spring from prickly more or less woody stems of the preceding year.*

R. triflòrus, Dwarf Raspberry. Low woods N.; almost wholly herbaceous, slender, trailing, not prickly, with thin smooth leaves, of 3 rhombic-ovate acute leaflets, or the side-leaflets parted, making 5, all doubly serrate, peduncle bearing 1 – 3 small flowers, and the fruit of few grains.

R. occidentàlis, Black R. or Thimbleberry. Borders of fields and thickets N., especially where ground has been burned over: glaucous-whitened, the long recurving stems, stalks, &c. armed with hooked prickles, but no bristles; leaflets mostly 3, ovate, pointed, white-downy beneath, coarsely doubly toothed, the lateral ones stalked; petals shorter than the sepals; fruit purple-black (or an amber-colored variety), flattish, ripe at midsummer.

R. Idæus, Garden R. Cult. from Eu. for the fruit: tall and nearly erect, beset with straight slender prickles or many of them mere bristles; leaves thicker, and fruit firmer and larger than in the next red or yellowish, ripening through the summer.

R. strigòsus, Wild Red R. Common especially N.: 2° – 3° high, the upright stems, stalks, &c. beset with copious bristles, and some of them becoming weak prickles, also glandular; leaflets oblong-ovate, pointed, cut-serrate, white-downy beneath, the lateral ones (either one or two pairs) not stalked; petals as long as the sepals; fruit light-red, tender and watery but high-flavored, ripening all summer.

§ 3. Blackberries, *with the pulpy grains of the fruit remaining attached to the pulpy receptacle, which at length falls away from the calyx: stems prickly: leaves of 3 or pedately 5 – 7 leaflets: flowers on leafy shoots from stems of the preceding year, in spring and early summer, with white spreading petals.*

* *Stems more or less woody: fruit black when ripe, eatable, the blackberries of the market, ripening in late summer and autumn.*

R. villòsus, High Blackberry. Everywhere along thickets, fence-rows, &c., and several varieties cult.: stems 1° – 6° high, furrowed; prickles strong and hooked; leaflets 3 – 5, ovate or lance-ovate, pointed, their lower surface and stalks hairy and glandular, the middle one long-stalked and sometimes

heart-shaped; flowers racemed, rather large, with short bracts; fruit oblong or cylindrical.

R. Canadénsis, Low B. or Dewberry. Rocky and sandy soil: long-trailing, slightly prickly, smooth or smoothish, and with 3 – 7 smaller leaflets than in the foregoing, the racemes of flowers with more leaf-like bracts, the fruit of fewer grains and ripening earlier.

R. cuneifòlius, Sand B. Sandy ground and barrens from N. Jersey S.: erect, 1° – 3° high, with stout hooked prickles; the branchlets and lower surface of the 3 – 5 wedge-obovate thickish leaves whitish-woolly; peduncles 2 – 4-flowered.

R. triviàlis, Southern Low B. Sandy soil from Virginia S.: trailing or creeping, bristly and prickly: the smooth partly evergreen leaves of 3 – 5 ovate-oblong or lance-oblong leaflets; peduncles 1 – 3-flowered.

* * *Stems scarcely woody but lasting over winter, wholly prostrate: fruit sour.*

R. híspidus, Running Swamp B. Low woods, &c. N.: with very long and slender running stems, beset with small reflexed prickles, sending up short leafy and flowering shoots; leaves of mostly 3 obovate blunt smooth and shining leaflets, of firm and thickish texture, somewhat evergreen; flowers small and few on a leafless peduncle; fruit of few grains, red or purple.

§ 4. Flowering Bramble: *cultivated for the flowers only.*

R. rosæfòlius, from China, called Brier Rose. Cult. in greenhouses and apartments, has pinnate leaves, and bears a succession of full-double white flowers resembling small roses.

11. ALCHEMÍLLA. (Name said to come from the Arabic.) A minute annual species, A. arvensis, called Parsley Piert in England, has got introduced in Virginia, &c.

A. vulgàris, Lady's Mantle, from Europe, is cult. in some gardens; it is a low herb, not showy, with somewhat downy rounded slightly 7 – 9-lobed leaves chiefly from the root, on long stalks, and loose corymbs or panicles of small light green flowers, through the summer. ♃

12. AGRIMÒNIA, Agrimony. (Old name, of obscure meaning.) Weedy herbs, in fields and border of woods, producing their small yellow flowers through the summer; the fruiting calyx, containing the 2 akenes, detached at maturity as a small bur, lightly adhering by the hooked bristles to the coats of animals. ♃

A. Eupatòria, Common A. Principal leaflets 5 – 7, oblong-obovate and coarsely toothed, with many minute ones intermixed; petals twice the length of the calyx; stamens 10 – 15.

A. parviflòra, chiefly S., has smaller flowers, 11 – 19 lanceolate principal leaflets, and 10 - 15 stamens.

A. incìsa, only S., has 7 - 9 oblong or obovate and smaller principal leaflets, small flowers, and 5 stamens.

13. POTÈRIUM, Burnet. (Old Greek name, of rather obscure application.) ♃

P. Sanguisórba, Garden or Salad B. Common in old gardens, from Europe: nearly smooth, growing in tufts; leaves of many small ovate and deeply toothed leaflets; stems about 1° high, bearing a few heads of light green or purplish monœcious flowers, in summer, the lower flowers with numerous drooping stamens, several of the uppermost with pistil, the style ending in a purple tufted stigma.

P. Canadénse, or Sanguisórba Canadensis, Canadian or Wild B. Wet grounds N.: 3° – 6° high, nearly smooth, with numerous lance-oblong coarsely-toothed leaflets often heart-shaped at base, and cylindrical spikes of white perfect flowers, in late summer and autumn; stamens only 4, their long white filaments club-shaped.

14. RÒSA, ROSE. (The ancient Latin name of the Rose.)

§ 1. WILD ROSES *of the country: only the first species cultivated.*

* *Styles lightly cohering in a column and projecting out of the calyx-cup.*

R. setígera, PRAIRIE or CLIMBING WILD ROSE. Rich ground, W. & S.: also planted, and partly the original of QUEEN-OF-THE-PRAIRIE, &c. double roses. Tall-climbing, armed with stout nearly straight prickles, not bristly; leaves with only 3 – 5 ovate acute leaflets; the corymbed flowers produced towards midsummer; stalks and calyx glandular; petals deep rose becoming nearly white.

* * *Styles separate, included in the calyx-tube, the stigmas closing its orifice: petals rose-color: stems not disposed to climb.*

R. Carolina, SWAMP ROSE. Wet grounds: stems 4° – 8° high, with hooked prickles and no bristles; leaflets 5 – 9, smooth, dull above and pale beneath; flowers numerous in the corymb (in summer); the calyx and globular hip glandular-bristly.

R. lùcida, DWARF WILD ROSE. Dry or moist ground: 1° – 2° high, with bristly or slender straight prickles, 5 – 9 oblong or almost lanceolate leaflets shining above, 1 – 3-flowered peduncles, bristly calyx, but the depressed hip nearly smooth: fl. all summer.

R. blànda, EARLY WILD ROSE. Rocky banks N.: 1° – 3° high, with straight weak prickles or none, 5 – 7 oval or oblong blunt and pale leaflets, sometimes hoary beneath, large stipules, 1 – 3-flowered peduncles and the calyx smooth and glaucous, the hip globular: fl. spring or early summer.

§ 2. BRIER-ROSES, *naturalized from Europe, by roadsides and in thickets, or sometimes planted: flowering in summer.*

R. rubiginòsa, SWEET-BRIER. Tall, disposed to climb, armed with strong and hooked and some slender and awl-shaped prickles, the roundish and doubly-serrate small leaflets downy and beset with russet glands beneath, giving the aromatic fragrance; flowers mostly solitary, pink; hip pear-shaped or obovate, crowned with the calyx-lobes.

R. micrántha, SMALL S. Probably a mere variety of the common Sweet-Brier, with uniform hooked prickles, smaller flower, and more oblong or oval hip, from which the calyx-lobes fall early.

R. canina, DOG ROSE. Roadsides E. Penn. and probably elsewhere: resembles Sweet-Brier, but the leaflets smooth or destitute of aromatic glands and simply serrate; flowers 3 or 4 together, pink or nearly white.

§ 3. EVERGREEN ROSES, *naturalized in the Southern States from China: flowering in spring, the flowers not double.*

R. Sínica (or LÆVIGÀTA), CHEROKEE ROSE. Planted for garden-hedges, &c., also run wild S., disposed to climb high, armed with strong hooked prickles, very smooth, with bright green and glossy evergreen leaves of mostly only 3 leaflets, and single flowers at the end of the branches, with bristly calyx-cup and large pure-white petals.

R. bracteàta, BRACTED ROSE. In hedges far S., not common; has downy branches armed with strong hooked prickles, 5 – 9 roundish leaflets, and single large white flowers on very short peduncle, the calyx covered by leafy bracts.

§ 4. EXOTIC GARDEN ROSES proper, *from Europe and Asia. Merely the principal types: the greater part of the modern garden roses too much mixed by crossing and changed by variation to be subjects of botanical study.*

* *Styles united in a column which projects out of the calyx-cup. All with long rambling shoots, or disposed to climb.*

R. sempérvirens, EVERGREEN ROSE of S., not hardy nor holding its leaves N., with coriaceous bright-green oblong leaflets, curved prickles, and nearly solitary white flowers, not double. The AYRSHIRE ROSE is a more hardy form of it.

R. moschàta, MUSCAT or MUSK ROSE; not climbing, with slender curved prickles, leaves of 5 or 7 lanceolate and pointed leaflets, a corymb of white flowers with a yellowish base to the petals, very sweet scented, especially at evening.

R. multiflòra, MANY-FLOWERED ROSE. A well-known climbing species, from Japan and China, hardy in Middle States, with 5 or 7 soft and somewhat rugose leaflets, slender scattered prickles, and full corymbs of small flowers, white, pale red, or rose-purple, not sweet-scented. The BOURSALT ROSE, said to come from the *multiflora*, is probably from a cross with some hardy European species.

* * *Styles not sensibly projecting nor united.*

+ *Tender, tall-climbing, and wholly destitute of prickles.*

R. Bánksiæ, BANKSIA ROSE, from China, a slender conservatory species, very smooth, with 3 – 5-lanceolate glossy leaflets, and umbels of very small white or buff and violet-scented flowers.

+ + *Tender, armed only with distant hooked prickles, smooth, with leaves of mostly 3 (3 – 5) rather coriaceous and shining leaflets, and awl-shaped or narrow stipules.*

R. Índica, INDIA or CHINA ROSES: includes the TEA, PERPETUAL or BENGAL, BOURBON, and NOISETTE ROSES; and the BENGAL POMPONS, &c. are miniature forms of similar origin.

+ + + *Hardy or mainly so at the north, not climbing, more or less prickly, and with leaves of 5 or more leaflets.*

R. Gállica, FRENCH or PROVENCE, RED ROSE, has slender stems beset with both stout curved and slender straight prickles, leaves of 5 – 7 rather rigid doubly and glandular-toothed leaflets more or less downy beneath, erect 1-flowered peduncles, and pink-red or crimson spreading petals (or variegated with white), which have some astringency, and are used for *conserve of roses*, &c.

R. centifòlia, HUNDRED-LEAVED or CABBAGE ROSE, perhaps derived from the preceding, has mostly straight prickles, 5 – 7 oval leaflets with glandular teeth or edges, peduncle and calyx clammy with odorous glands, the hip bristly and glandular, the flowers mostly nodding, large, and full-double, rose-purple, or of various shades, rarely white. POMPON ROSES are miniature varieties. MOSS ROSES are abnormal states with the glands and bristles of the calyx and peduncle developed into a moss-like substance. Petals used for *rose-water, essence of roses*, &c.

R. Damascèna, DAMASK ROSE, &c. Known from the foregoing by the greener bark, larger curved prickles, corymbed flowers oblong in the bud, and with the long sepals (some of them pinnatifid or lobed) reflexed during flowering, the hip oblong and pulpy: petals rose-purple, white, &c.; used in preference for *attar-of-roses* and rose-water.

R. álba, WHITE ROSE, is between the preceding and the Dog Rose; leaflets 5, glaucous and a little downy beneath; prickles straightish and slender; petals pure white.

R. cinnamòmea, CINNAMON ROSE, of Eu., met with in country gardens, is related to our wild R. blanda, 5° to 8° high, with brownish-red bark, and some straightish prickles, pale leaves downy underneath, and small pale-red cinnamon-scented (mostly double) flowers, not showy.

R. spinosíssima, BURNET or SCOTCH ROSE, of Eu. Low, 1° or 2° high, exceedingly prickly with straight prickles, with 7 to 9 small and roundish smooth leaflets, and small early flowers, either single or double, and white, pink, and even yellow, the hips cartilaginous.

R. Eglantèria, YELLOW EGLANTINE ROSE. Like a Sweet-Brier, but lower, 3° – 5° high, with scattered straight prickles; leaves deep-green and sweet-scented; flowers deep yellow, orange, or buff, and sometimes variegated with red, either single or double.

R. sulphùrea, the old YELLOW ROSE, from the Far East. Tall, with scattered prickles, glaucous or pale scentless leaves, and sulphur-yellow (full-double) flowers.

15. CRATÆGUS, HAWTHORN, WHITE THORN. (Old Greek name.) Small trees or shrubs, with hard wood; flowers white, except in some varieties of English Hawthorn, in spring or early summer; ripening the red or reddish fruit mostly in autumn.

§ 1. *Flowers many in the corymb, small, with 5 styles; fruit not larger than small peas, scarlet or coral-red: leaves, &c., smooth or nearly so.*

C. Pyracántha, EVERGREEN THORN. Planted for ornament and sparingly nat. from S. Penn. S. (from S. Europe): shrub 4° – 6°, with the shining evergreen leaves lance-spatulate and crenulate, only 1′ long, and small clusters of flowers terminating short branches.

C. spathulàta. Tall shrub or low tree, from Virginia S., with almost evergreen shining spatulate leaves, crenate towards the apex, or on vigorous shoots cut-lobed, and with hardly any petiole.

C. cordàta, WASHINGTON T. Small tree, from Virg. and Kentucky S., and has been planted for hedges; has broadly triangular-ovate or heart-shaped thinnish leaves, often 3 – 5-cleft or cut and serrate, on slender petiole.

§ 2. *Flowers many in the corymb, middle-sized: fruit coral-red, ovoid, rather small.*

C. arboréscens. River-banks far S.: tree with few stout thorns or none, thin oblong serrate leaves acute at both ends, on slender petioles; styles 5.

C. Oxyacántha, ENGLISH HAWTHORN. Planted from Eu. for ornament and hedges; tree or shrub with obovate smooth leaves wedge-shaped at base, cut-lobed and toothed above; styles 2 or 3, rarely only 1. With single or double, white, rose, or pink-red flowers.

C. apiifòlia, PARSLEY-LEAVED T. Common S. Small tree soft-downy when young; the leaves smoothish with age, pinnatifid, the 5 – 7 lobes crowded, cut and toothed; petioles slender; styles 1 – 3.

§ 3. *Flowers many in the corymb, large; the calyx-teeth with the bracts and stipules often beset with glands: fruit edible, half an inch or more long, its cells or stones and the styles variable in number, 1 – 5. All tall shrubs or low trees, of thickets and rocky banks, or planted.*

C. coccínea, SCARLET-FRUITED T. Smooth, with the leaves thin, roundish-ovate, sharply cut-toothed or lobed, on slender petioles, the coral or scarlet fruit much smaller than in the next and hardly eatable.

C. tomentòsa, PEAR or BLACK T. Downy or soft-hairy when young; the leaves thickish, oval, ovate, or obovate, sharply toothed or cut, below abruptly narrowed into a margined petiole, the upper surface impressed along the main veins or ribs; flowers often 1′ broad, and scarlet or orange fruit from two thirds to three fourths of an inch long, pleasant-tasted. Of many varieties: the two which differ most from the common one with the well-flavored fruit are: Var. PUNCTÀTA, with smaller and wedge-obovate leaves irregularly toothed towards the summit, and dull red and yellowish fruit, sometimes white-dotted. Var. MÓLLIS, of the Western States, with rounded soft-downy leaves, not tapering but sometimes even heart-shaped at base, sharply doubly toothed and cut; fruit dull red and less pleasant-tasted.

C. Crus-gálli, COCKSPUR T. Smooth; the wedge-obovate or oblanceolate leaves thick and firm, deep-green and glossy, serrate above the middle, tapering into a very short petiole; thorns very long and sharp; fruit bright red. The best species for hedges: has both narrow and broad-leaved varieties.

§ 4. *Flowers solitary, in pairs, or only 3 – 6 in the corymb; styles, and cells, 4 – 5: leaves mostly pubescent underneath: fruit often eatable.*

C. æstivàlis, SUMMER HAW of S. States. Along pine-barren ponds, from S. Car. S. & W.: tree with spatulate or wedge-obovate coriaceous leaves, crenate above the middle, no glands, 3 – 5-flowered peduncles, and large red juicy fruit, pleasantly acid, used for tarts, &c.: ripe in summer.

C. flàva, YELLOW or SUMMER HAW. Sandy soil, from Virginia S.: small tree, with wedge-obovate leaves downy or smoothish, toothed or cut above the middle, the teeth or margins and short petiole glandular; the pear-shaped or globular fruit yellowish, greenish, or tinged with red.

C. parvifòlia, SMALL-LEAVED or DWARF THORN Pine-barrens from N. Jersey S.: shrub 3° – 6° high, downy, with thick and firm spatulate-obovate crenate leaves, these as well as the mostly solitary flowers almost sessile, calyx-lobes glandular-toothed and as long as the petals; the large fruit pear-shaped or globular, at first hairy, greenish and yellowish.

16. COTONEÁSTER. (*Cotoneum* was a Roman name of the Quince. Name here alludes to the cottony covering of the shoots, lower face of the leaves, &c. of these small-leaved and small-flowered, chiefly Old-World shrubs.)

C. vulgàris. Planted from Eu.: hardy shrub, 2° – 4° high, much branched, with deciduous ovate or rounded leaves hardly 1′ long, glabrous calyx, flesh-colored or white flowers in spring, and reddish fruit. And some rarer, evergreen species are in choicer ornamental grounds.

17. PHOTÍNIA. (From Greek word for shining, alluding to the glossy leaves of the genuine species.) Choice greenhouse shrubs or small trees, hardy S., with large evergreen leaves.

P. arbutifòlia, of California, a smooth shrub, with rigid sharply-toothed leaves and broad panicle of white flowers, should be hardy S. of Penn.

P. serrulàta, of Japan and China, is smooth, with longer finely serrulate leaves, and copious white flowers.

P. (or Eriobòtrya) Japónica, the LOQUAT-TREE, of Japan, with almost entire leaves nearly 1° long, the lower surface and corymb clothed with dense rather rusty wool, has fewer and larger downy yellowish-white flowers, and an edible yellow fruit, resembling a small apple, with 1 – 5 large seeds.

18. AMELÁNCHIER, JUNE-BERRY, SERVICE-BERRY. (Popular name of the European species in Savoy.) Flowering in spring, and producing the berry-like purplish fruit (edible, sweet, sometimes very pleasant-flavored) in summer. We have apparently two or three wild species; but they run together so that botanists incline to regard them as forms of one.

A. Canadensis, also called SHADBUSH in New England, because it blossoms just when shad appear in the rivers. Var. BOTRYÀPIUM is the tree, smooth even from the first, or nearly so, with ovate-oblong very sharply serrate leaves, long loose racemes, and oblong petals 4 times the length of the calyx. Var. OBLONGIFÒLIA is either tree or shrub, with the oblong leaves and branchlets white-cottony when young, and the racemes and petals shorter. Var. ALNIFÒLIA, chiefly W., is a shrub with roundish blunt leaves toothed only towards the summit, and flowers like the preceding. Var. OLIGOCÁRPA, is a shrub of cold bogs N., very smooth, with thin oblong sharply-serrate leaves, and only 2 – 5 flowers in the raceme.

19. PÝRUS, PEAR, APPLE, &c. (Classical name of the Pear-tree.) Botanically the genus is made to include a great variety of things, agreeing in the cartilaginous, parchment-like, or thin-walled cells that contain the seeds. Wood hard and tough. Fl. spring.

§ 1. PEAR. *Leaves simple: flowers in a simple corymb or cluster: fruit with its base tapering down to the stalk.*

P. commùnis, COMMON PEAR. Cult. from Eu.: a smooth tree, with branches inclined to be thorny, ovate leaves, and pure white flowers, the anthers purple.

§ 2. APPLE. *Leaves simple: flowers showy, in a simple cluster or simple umbel: fruit sunken (umbilicate) at both ends, especially at the base.*

* *Exotic: leaves simply and evenly serrate, ovate or oblong.*

P. Màlus, COMMON APPLE. Cult. from Eu.: tree with buds, lower face of the leaves when young, and calyx woolly, flowers white and tinged with pink, and large fruit.

P. spectábilis, Chinese Flowering-A. Cult from China, for its showy bright rose-colored flowers, which are double or semi-double; the leaves &c. smooth, except when very young.

P. prunifòlia, Siberian Crab-A. Cult. for the fruit: smooth or nearly so, except the newly developed leaves and the peduncles; styles woolly at the base; fruit yellowish. The better Crab-Apples are perhaps crosses of this with the Common Apple.

* * *Wild species, with some of the leaves irregularly cut-toothed, or even lobed: the bright rose-colored flowers and the greenish fruit very fragrant.*

P. coronària, American or Garland Crab-A. Glades from W. New York W. & S.: small tree, soon smooth, with the mostly ovate leaves rounded or obscurely heart-shaped at base and inclined to be 3-lobed.

P. angustifòlia, Narrow-leaved Crab-A. Glades W. & S., with narrow-oblong or lanceolate leaves: otherwise too like the last.

§ 3. Chokeberry. *Leaves simple, the upper face with some small glands along the midrib: flowers (white) in compound cymes terminating the branches: styles united at base: fruit berry-like.*

P. arbutifòlia, Common Chokeberry. Low woods and bogs; shrub with small obovate or oblong finely serrate leaves, and a juicy insipid berry, not larger than a pea, either purple or black, pear-shaped or globular.

§ 4. Rowan-Tree *or* Mountain-Ash. *Leaves odd-pinnate, of several (9–17) leaflets: flowers (numerous and white) in ample compound flat cymes terminating the branches of the season: fruit berry-like, scarlet-red when ripe. Trees often planted for ornament, especially for the clusters of showy fruit in autumn.*

P. Americàna, American Mountain-Ash. Slender tree or tall shrub, wild in the cooler districts; smooth or soon becoming so, with lanceolate taper-pointed and sharply serrate bright-green leaflets on a reddish stalk, pointed and smooth glutinous leaf-buds, and berries not larger than peas.

P. sambucifòlia, Elder-leaved R. or M. Wild along the northern frontiers; smooth or nearly so, with oblong or lance-ovate and blunt or abruptly short-pointed leaflets, coarsely serrate with more spreading teeth, sparingly hairy leaf-buds, and larger berries.

P. aucupària, European R. or M. Planted from Eu.; forms a good-sized tree, with oblong and obtuse paler leaflets, their lower surface, stalks, and the leaf-buds downy; and the berries larger ($\frac{1}{2}'$ in diameter).

20. CYDÒNIA, Quince. (Named from a city in Crete.)

C. vulgàris, Common Quince. Cult. from the Levant; small tree, nearly thornless, with oval or ovate entire leaves (Lessons, p. 55, fig. 83) cottony beneath; flowers solitary at the end of the leafy branches of the season, in late spring, with leafy calyx-lobes, white or pale-rose petals, and stamens in a single row; the large and hard fruit pear-shaped, or in one variety apple-shaped, fragrant; seeds mucilaginous.

C. Japónica, Japan Quince (also named Pyrus Japonica). Thorny, smooth, widely branched shrub, from Japan; cult. for the large showy flowers, which are produced in spring, earlier than the oval or wedge-oblong leaves, on side spurs, in great abundance, single or more or less double, scarlet-red, or sometimes with rose-colored or even almost white varieties; calyx with short and rounded lobes; fruit green, very hard, resembling a small apple, but totally uneatable.

39. CALYCANTHACEÆ, CALYCANTHUS FAMILY.

Shrubs with opposite entire leaves, no stipules, sepals and petals imbricated and indefinite in number and passing one into the other, stamens few or many with anthers turned outwards, all these parts on a hollow receptacle or calyx-cup in the manner of a rose-hip,

enclosing numerous pistils which ripen into akenes. Cotyledons rolled up from one margin. Flowers rather large, mostly aromatic, as is the wood also.

1. CALYCANTHUS. Flowers livid-purple or dull red, solitary in the axils or terminating leafy branches, with loose bracts passing to colored lanceolate sepals, and these into similar thickish petals, which are borne on the summit of the closed calyx-tube: within these are numerous short stamens; the outer 12 or more having anthers ending in a tip; the inner smaller and with imperfect anthers or none. Pistils enclosed in the fleshy cup; ovary with 2 ovules; styles slender. Akenes oval, coriaceous, enclosed in the leathery hip, which becomes about 2′ long.
2. CHIMONANTHUS. Flowers yellow and purplish, along naked shoots, sessile in axils of fallen leaves. Bracts and sepals scale-like, ovate, purplish or brownish. Petals honey-yellow, or the innermost red. Stamens with anthers only 5.

1. CALYCÁNTHUS, CAROLINA ALLSPICE or SWEET-SCENTED SHRUB. (Name from Greek for *cup* and *flower*.) All wild in U. S., and cult., especially the first, which has the more fragrant strawberry-scented blossoms. Fl. spring and all summer.

C. flóridus. Wild S. of Virginia in rich woods: leaves soft-downy beneath, 1′-3′ long, oval or oblong.

C. lævigàtus. Wild from S. Penn. S.: smooth and green, with oval or oblong leaves 1′-3′ long, and rather small flowers (1½′ across).

C. glaùcus. Wild from Virginia S.: like the foregoing, but with mostly larger and taper-pointed leaves, glaucous beneath.

C. occidentàlis, WESTERN C. Cult. from California: smooth, with ovate or ovate-oblong and slightly heart-shaped larger leaves (5′-6′ long), *green both sides, the upper surface roughish; the brick-red flowers 3′ across,* scentless; akenes hairy.

2. CHIMONÁNTHUS, JAPAN ALLSPICE. (Name in Greek means *winter-flower*; it flowers in the winter in a mild temperate climate.)

C. fràgrans. Shrub with long branches, which may be trained like a climber, smooth lance-ovate pointed leaves, and rather small fragrant flowers, hardy S. of Penn.

40. SAXIFRAGACEÆ, SAXIFRAGE FAMILY.

A large family not readily defined by any single characters; distinguished generally from Rosaceæ by having albumen in the seeds, ovaries partly or wholly united, and seldom any stipules; the herbs, and most of the shrubs of the family have only as many or twice as many stamens, and fewer styles or stigmas, than there are petals or sepals. Flowers mostly perfect. — Besides the plants described, there may be met with in choice conservatories:

CUNÒNIA CÁPENSIS, a small tree from Cape of Good Hope, with opposite odd-pinnate leaves and a large stipule between their petioles on each side:

BAUERA RUBIOÌDES, from Australia, a slender bushy shrub, with opposite leaves of 3 almost sessile narrow leaflets, looking like 6 simple leaves in a whorl, and pretty rose-colored widely open flowers in their axils.

I. Shrubs, with simple leaves (includes plants which have been ranked in two or three different families). None of the following have stipules, except Ribes. Seeds numerous.

§ 1. *Leaves alternate.*

1. RIBES. Leaves palmately veined and lobed; sometimes with narrow stipules united with the base of the petiole. Calyx with its tube cohering with the ovary, and often extended beyond it, the 5 lobes usually colored like the petals. Petals and stamens each 5, on the throat of the calyx, the former small and mostly erect. Styles 2 or partly united into one; ovary 1-celled with 2 parietal placentæ, in fruit becoming a juicy berry, crowned with the shrivelled remains of the rest of the flower.
2. ITEA. Leaves pinnately veined, not lobed. Flowers in a raceme. Calyx nearly free from the 2-celled ovary, 5-cleft. Petals lanceolate, much longer than the calyx, and inserted along with the 5 stamens near its base. Pod slender, 2-celled, splitting through the style and the partition.

§ 2. *Leaves opposite. Calyx-tube wholly coherent with the top-shaped or hemispherical ovary, but not at all extended beyond it.*

* *Stamens indefinite*, 20 – 40.

3. DECUMARIA. Flowers small, in a compound terminal cyme. Calyx minutely 7 – 10 toothed. Style thick. Petals 7 – 10, valvate in the bud. Pod small, top-shaped, many-ribbed, bursting at the sides between the ribs.
4. PHILADELPHUS. Flowers showy, often corymbed or panicled. Calyx with 4 or 5 valvate lobes. Petals 4 or 5, broad, convolute in the bud. Styles 3 – 5, usually somewhat united below. Ovary 3 – 5-celled, becoming a pod, which splits at length into as many pieces.

* * *Stamens only twice as many as the petals*. 8 or 10.

5. DEUTZIA. Flowers all alike and perfect, more or less panicled, showy. Lobes of the calyx 5. Petals 5, valvate with the edges turned inwards. Filaments flat, the 5 alternate ones longer, commonly with a tooth or fork on each side next the top. Styles 3 – 5, slender. Pod 3 – 5-celled.
6. HYDRANGEA. Flowers in cymes, commonly of two sorts, the marginal ones (or in high-cultivated plants almost all) enlarged and neutral, consisting of corolla-like calyx only (Lessons, p. 84, fig. 167): the others perfect, with a 4 – 5-toothed calyx, as many small petals valvate in the bud, and twice as many stamens with slender filaments. Style 2 – 5, diverging. Ovary 2 – 5-celled, becoming a small pod which opens at the top between the styles.

II. Herbs, forming the SAXIFRAGE FAMILY proper. Stipules none or confluent with the base of the petiole. Seeds usually many.

* *Stamens as many as the petals and alternate with them, usually 5, and a cluster of gland-tipped sterile filaments before each petal: stigmas mostly 4, directly over as many parietal placentæ.*

7. PARNASSIA. Flower solitary, terminating a scape-like stem; the leaves mostly from the root, rounded, smooth, and entire. Calyx free from the ovary, of 5 sepals. Petals 5, veiny, imbricated in the bud. Styles none. Pod 1-celled, many-seeded.

* * *Stamens only as many as the petals, 4 or 5: no sterile filaments: styles 2 and alternate with the placentæ or partition.*

8. HEUCHERA. Flowers small, in a long panicle, mostly on a scape. Calyx bell-shaped, the tube cohering below with the 1-celled ovary, and continued beyond it, above 5-cleft, and bearing 5 small spatulate erect petals at the sinuses. Styles slender. Pod 1-celled, 2-beaked at the apex, opening between the beaks.
9. BOYKINIA. Flowers in a corymb-like cyme. Calyx 5-lobed, the tube cohering with the 2-celled ovary. Petals 5, convolute in the bud, deciduous. Styles 2, short. Pod 2-celled, opening between the two beaks.

* * * *Stamens twice the number of the petals or the lobes of the calyx, mostly* 10; *pod commonly 2-lobed, beaked, or 2, rarely 3 – 4, nearly separate pods.*

+ *Petals entire, mostly* 5.

10. SAXIFRAGA. Flowers in cymes or panicles, or rarely solitary, perfect. Leaves simple or palmately cut. Petals imbricated in the bud. Pod 2-celled below, or 2 (rarely more) separate pistils and pods, many-seeded.
11. ASTILBE. Flowers in spikes or racemes collected in an ample compound panicle, sometimes polygamous or diœcious. Leaves ample, decompound.

Petals small, spatulate or linear. Little pods 2 or 3, nearly separate, opening down the inner suture, several-seeded.

12. TIARELLA. Flowers in a raceme. Calyx colored (white), 5-parted, and in the sinuses bearing 5 very narrow slender-clawed petals. Filaments and styles long and slender. Ovary 1-celled, with several ovules towards the base of the 2 parietal placentæ, 2-beaked; one of the beaks or carpels growing much more than the other and making the larger part of the lance-shaped membranaceous pod, which is few-seeded towards the bottom.

+ + *Petals 5, pinnatifid, very delicate.*

13. MITELLA. Flowers in a simple raceme or spike, small. Petals colored like the short open calyx (white or green). Stamens short. Styles 2, very short. Ovary and pod globular, 1-celled, with 2 parietal placentæ at the base, many-seeded, opening across the top.

+ + + *Petals none.*

14. CHRYSOSPLENIUM. Flowers yellowish-green, solitary or in a leafy cyme. Calyx-tube coherent with the ovary, the tube or expanded border with 4 or 5 blunt lobes. Stamens 8 or 10, very short. Styles 2, short, recurved. Pod obcordate, thin, its notched summit rising above the calyx-tube, 1-celled with 2 parietal placentæ, several-many-seeded.

1. RÌBES, CURRANT, GOOSEBERRY. (An Arabic name.) Leaves plaited in the bud, except the last species, often clustered in the axils of those of previous season. Fl. spring. Fruit mostly eatable.

§ 1. GOOSEBERRY. *Stems commonly with 1 or 2 thorns below the leafstalks or the clusters of leaves, often with numerous scattered prickles besides, these sometimes on the berry also.*

* *Cultivated species.*

R. speciòsum, SHOWY FLOWERING-GOOSEBERRY, of California: cult. for ornament, especially in England, likely to succeed in Southern Middle States, is trained like a climber; has small and shining leaves, 1 – 3 very handsome flowers on a hanging peduncle, the short-tubular calyx, petals, and long-projecting stamens deep red, so that the blossom resembles that of a Fuchsia; berry prickly, few-seeded.

R. Grossulària, GARDEN OR ENGLISH GOOSEBERRY. Cult. from Eu. for the well-known fruit; thorny and prickly, with small obtusely 3 – 5-lobed leaves, green flowers 1 – 3 on short pedicels, bell-shaped calyx, and large berry.

* * *Native species (chiefly N. & W.), passing under the general name of* WILD GOOSEBERRY, *with greenish or dull-purplish blossoms, only 1 – 3 on each peduncle.*

R. hirtéllum, the commonest E., is seldom downy, with very short thorns or none, very short peduncles, stamens and 2-cleft style scarcely longer than the bell-shaped calyx; and the smooth berry purple, small, and sweet.

R. rotundifòlium, commoner W., is often downy-leaved; peduncles slender, the slender stamens and 2-parted style longer than the narrow calyx; berry smooth.

R. Cynósbati, of rocky woods N., is downy-leaved, with slender peduncles, stamens and undivided style not exceeding the broad calyx, and large berry usually prickly.

* * * *Native species with the prickly stems of a Gooseberry, but with a raceme of flowers like those of a Currant.*

R. lacústre, LAKE OR SWAMP G. Cold bogs and wet woods N.: low, with 3 – 5-parted leaves, their lobes deeply cut, very small flowers with broad and flat calyx, short stamens and style, and small bristly berries of unpleasant flavor.

§ 2. CURRANT. *No thorns nor prickles, and the flowers numerous in the racemes.*

* *Wild, or cultivated for the fruit: flowers greenish or whitish.*

+ *Leaves without resinous dots: calyx flat and open: berries red (or white).*

R. prostràtum, FETID C. Cold woods N.; with reclining stems, deeply heart-shaped and acutely 5 – 7-lobed leaves, erect racemes, pedicels and pale-red

berries glandular-bristly; these and the bruised herbage exhale an unpleasant, skunk-like odor.

R. rùbrum, RED C. Cult from Eu., also wild on our northern borders; with straggling or reclining stems, somewhat heart-shaped moderately 3-5-lobed leaves, the lobes roundish, and drooping racemes from lateral buds distinct from the leaf-buds; edible berries red, or a white variety.

+ + *Leaves sprinkled with resinous dots: flowers larger, with oblong-bell-shaped calyx: berries larger, black, aromatic and spicy, glandular-dotted.*

R. flóridum, WILD BLACK C. Woods N. leaves slightly heart-shaped, sharply 3-5-lobed and doubly serrate; racemes drooping, downy, bearing many whitish flowers, with conspicuous bracts longer than the pedicels.

R. nìgrum, GARDEN BLACK C. Cult. from Eu.: like the preceding, but has greener and fewer flowers in the raceme, minute bracts, and a shorter calyx.

* * *Cultivated for ornament from far W.: the flowers highly colored.*

R. sanguíneum, RED-FL. C., from Oregon and California: glandular and somewhat clammy, with 3-5-lobed leaves whitish-downy beneath, nodding racemes of rose-red flowers, the calyx-tube oblong-bell-shaped, the berries glandular and insipid.

R. aùreum, GOLDEN, BUFFALO, or MISSOURI C.: from W. Missouri to Oregon; abundantly cult. for its spicy-scented bright-yellow flowers in early spring; smooth, with rounded 3-lobed and cut-toothed leaves (which are rolled up in the bud), short racemes with leafy bracts, and tube of the yellow calyx very much longer than the spreading lobes; the berries blackish, insipid.

2. ITEA. (Greek name of Willow, applied to something widely different.)

I. Virgínica, a tall shrub, in low pine-barrens from N. Jersey S., smooth, with oblong minutely serrate leaves, and racemes of pretty white flowers, in early summer.

3. DECUMÀRIA. (Name probably meaning that the parts of the flower are in tens, which is only occasionally the case.)

D. bárbara. Along streams S.: a tall, mostly smooth shrub, with long branches disposed to climb, ovate or oblong shining leaves, and a compound terminal cyme of small white odorous flowers, in late spring.

4. PHILADÉLPHUS, MOCK-ORANGE, SYRINGA (which is the botanical name of the Lilac. The generic name is an ancient one, afterwards applied to these shrubs for no particular reason). Ornamental shrubs; natives of the S. Atlantic and Pacific States, Japan, &c.; the species mixed or much varied in cultivation. The following are the principal types.

P. coronàrius, COMMON MOCK-ORANGE. Cult. probably from Japan. Shrub with erect branches, smoothish oblong-ovate leaves having the taste and smell of cucumbers, and crowded clusters of handsome and odorous cream-white flowers, in late spring.

P. latifòlius, BROAD-LEAVED M. Cult., unknown wild, has the erect stems of the first, is robust, 6°-12° high, with the ovate and toothed 5-ribbed leaves hairy beneath, and large pure-white and nearly scentless flowers clustered, in early summer.

P. inodòrus, SCENTLESS M. Wild in upper districts S.: shrub smooth, with spreading slender branches, mostly entire ovate-oblong leaves, rather small flowers scattered at the end of the diverging branchlets, and calyx-lobes not longer than the ovary.

P. grandiflòrus, LARGE-FL. M. Wild along streams from Virginia S., and planted in several varieties: tall shrub, with long recurving branches, ovate and pointed usually toothed smoothish or slightly downy leaves, and very large pure-white scentless flowers, in early summer, either single or in loose clusters at the end of the branches, the slender-pointed calyx-lobes much longer than the ovary.

P. Gordoniànus, cult. from Oregon, is seemingly a variety of the last, very tall, and the large flowers appearing at midsummer.

P. hirsùtus, Hairy M. Wild in N. Car. and Tenn., sparingly cult.: slender, with recurving branches, the small ovate and acute sharply-toothed leaves hairy, and beneath even hoary; the small white flowers solitary or 2 - 3 together at the end of short racemose side branchlets.

5. DEÚTZIA. (Named for one *Deutz*, an amateur botanist of Amsterdam.) Fine flowering shrubs of Japan and China, with numerous panicles of white blossoms, in late spring and early summer; the lower side of the leaves, the calyx, &c. beset with minute starry clusters of hairs or scurf.

D. grácilis, the smallest species, is 2° high, with lance-ovate sharply serrate leaves bright green and smooth, and rather small snow-white flowers, earlier than the rest, often forced in greenhouses; filaments forked at the top.

D. crenàta. Commonly planted; a tall shrub, rough with the fine pubescence, with pale ovate or oblong-ovate minutely crenate-serrate leaves, and rather dull white blossoms in summer; the filaments broadest upwards and with a blunt lobe on each side just below the anther. This is generally cult. under the name of the next, viz.

D. scàbra, with more rugose and rougher finely sharp-serrate leaves, and entire taper-pointed filaments: seldom cult. here.

6. HYDRÁNGEA. (Name of two Greek words meaning *water* and *vase;* the application obscure.) Fl. summer.

* *Cultivated from China and Japan: house-plants N., turned out for summer.*

H. Horténsia, Common Hydrangea, is very smooth, with large and oval, coarsely toothed, bright-green leaves, and the flowers of the cyme nearly all neutral and enlarged, blue, purple, pink, or white.

* * *Wild species, on shady banks of rivers, &c., but often planted for ornament. Styles mostly only 2: flowers white, the sterile enlarged ones turning greenish or purplish with age, persistent.*

H. quercifòlia, Oak-leaved H. Stout shrub 3° - 6° high, very leafy, downy, with oval 5-lobed large leaves, and cymes clustered in oblong panicle, with numerous sterile flowers. Wild from Georgia S., hardy N. in cult.

H. radiàta, called more fittingly H. nívea, having the ovate or somewhat heart-shaped pointed leaves very white-woolly beneath, but smooth and green above; the flat cyme with a few enlarged sterile flowers round the margin. Wild S. of Virginia.

H. arboréscens, wild from Penn. and Ill. S., rarely planted, is smooth, with ovate or slightly heart-shaped serrate pointed leaves green both sides, the flat cyme often without any enlarged sterile flowers, but sometimes with a full row round the margin.

7. PARNÁSSIA, GRASS-OF-PARNASSUS. Wild on wet banks; the large white flower handsome, in summer and autumn. ♃

P. Caroliniàna, the only common species, both N. & S., has the scape or stem 1° - 2° high, bearing one clasping leaf low down, and terminated with a flower over 1′ broad, the many-veined petals sessile, with 3 stout small sterile filaments before each.

P. palústris, scarce on northern borders, is small throughout, with several slender filaments before each few-veined petal.

P. asarifòlia, along the Alleghanies S., has rather kidney-shaped leaves, and petals narrowed at base into a short claw; otherwise like the first.

8. HEÚCHERA, ALUM-ROOT, the rootstock being astringent. (Named for a German botanist, *Heucher*.) Wild plants of rocky woods, chiefly W. and S. along the middle country; the leaves rounded heart-shaped and more or less lobed or cut, mostly from the rootstock, often one or two on the tall stalk of the panicle. Flowers mostly greenish, in summer. ♃

* *Flowers very small: stamens and styles protruding.*

H. Americàna, Common A.: the only one N. and E. of Penn., has scapes and loose panicle (2° – 3° high) clammy-glandular and often hairy, leaves with rounded lobes, and greenish flowers in early summer.

H. villòsa, from Maryland and Kentucky S. along the upper country, is lower, beset with soft often rusty hairs, has deeper-lobed leaves, and very small white or whitish flowers, later in summer.

* * *Flowers larger (the calyx fully ¼' long), in a narrower panicle, greenish, with stamens little if at all protruding: leaves round and slightly 5 – 9-lobed.*

H. híspida. Mountains of Virginia and N. W. Tall (scape 2° – 4° high), usually with spreading hairs; stamens a little protruding.

H. pubéscens. From S. Penn. S. Scapes (1° – 3° high) and petioles roughish-glandular rather than pubescent; stamens shorter than the lobes of the calyx.

9. BOYKÍNIA. (Named for the late *Dr. Boykin*, of Georgia.) ♃

B. aconitifòlia, occurs only along the Alleghanies from Virginia S.: stem clammy-glandular, bearing 3 or 4 alternate palmately 5 – 7-cleft and cut leaves and a cyme of rather small white flowers, in summer. There is one very like it in Oregon and California.

10. SAXÍFRAGA, SAXIFRAGE. (Latin name, means *rock-breaker*: many species rooting in the clefts of rocks.) Besides the following, there are a number of rare or local wild species.

* *Wild species, with leaves all clustered at the perennial root, the naked scape clammy above and bearing many small flowers in a panicle or cyme, the two ovaries united barely at the base, making at length a pair of nearly separate divergent pods.*

S. Virginiénsis, Early S. On rocks and moist banks; with obovate or wedge-spatulate thickish more or less toothed leaves in an open cluster, scape 3' – 9' high, bearing in early spring white flowers in a dense cluster, which at length opens into a loose panicled cyme; calyx not half the length of the petals; pods turning purple.

S. Pennsylvánica, Swamp S. In low wet ground N.; with lance-oblong or oblanceolate obtuse leaves (4' – 8' long) obscurely toothed and narrowed into a very short broad petiole, scape 1° – 2° high, bearing small greenish flowers in an oblong cluster, opening with age into a looser panicle (in spring); the reflexed lobes of the calyx as long as the lance-linear petals.

S. eròsa, Lettuce S. Cold brooks, from Penn. S. along the Alleghanies; the lance-oblong obtuse leaves (8' – 12' long) sharply erosely toothed; scape 1° – 3° high, bearing a loose panicle of slender-pedicelled small white flowers (in summer); with reflexed sepals as long as the oval petals, and club-shaped filaments.

* * *Exotic species, cult. for ornament: leaves all clustered at the perennial root: ovaries 2, or sometimes 3 – 4, almost separate, becoming as many nearly distinct pods.*

S. crassifòlia, Thick-leaved S. Cult. from Siberia, very smooth, with fleshy and creeping or prostrate rootstocks, sending up thick roundish-obovate nearly evergreen leaves, 6' – 9' long, and scapes bearing an ample at first compact cyme of large bright rose-colored flowers, in early spring.

S. sarmentòsa, Beefsteak S., also called Strawberry Geranium. Cult. from China and Japan as a house-plant, not quite hardy N., rather hairy, with rounded heart-shaped or kidney-shaped and doubly toothed leaves of fleshy texture, purple underneath, green-veined or mottled with white above, on shaggy petioles, from their axils sending off slender strawberry-like runners, by which the plant is multiplied, and scapes bearing a light very open panicle of irregular flowers, with 3 of the petals small rose-pink and yellow-spotted, and 2 much longer and nearly white ones lanceolate and hanging.

11. ASTÍLBE. (Name means *not shining.*) Also called HOTEIA, after a Japanese botanist. Fl. summer. ♃

A. decándra. Rich woods along the Alleghanies from Virginia S.: a tall, rather pubescent herb, 3° - 5° high, imitating Spiræa Aruncus (p. 121) in appearance, but coarser; leaflets of the decompound leaves mostly heart-shaped, cut toothed (2′ - 4′ long); flowers greenish-white, with inconspicuous petals.

A. Japónica, or HOTEIA JAPONICA. Cult. from Japan for ornament: only 1° - 2° high, with leaflets of the thrice-ternate leaves lance-ovate or oblong, and crowded white flowers of considerable beauty.

12. TIARÉLLA, FALSE MITREWORT. (Diminutive of *tiara*, a turban; name not very appropriate.) ♃

T. cordifòlia, our only species, in rocky woods, especially N.: a low and hairy herb, spreading by summer leafy runners; leaves rounded heart-shaped, sharply lobed and toothed; flowers in a short raceme on a leafless scape, bright white, in spring.

13. MITÉLLA, MITREWORT, BISHOP'S-CAP. (Name means *a little mitre*, from the shape of the 2-cleft ovary and young pod.) Delicate plants of moist woods, especially N., spreading by summer leafy runners or rootstocks: fl. late spring and early summer. ♃

M. diphýlla, COMMON OR TWO-LEAVED M. Hairy, with rounded heart-shaped and somewhat 3 - 5-lobed root-leaves on slender petioles, and a pair of opposite nearly sessile leaves on the scape below the slender raceme of many white flowers.

M. nùda, NAKED-STALKED M. Mossy woods N.: a delicate little plant, with roundish kidney-shaped doubly crenate leaves, and leafless scape (4′ - 6′ high) bearing a few greenish blossoms.

14. CHRYSOSPLÈNIUM, GOLDEN SAXIFRAGE. (Name in Greek means *golden spleen.*) Fl. spring. ♃

C. Americànum, our only species, in springs or shady wet places N.: a low and delicate smooth herb, with spreading repeatedly forked stems, tender succulent small leaves, which are roundish, obscurely crenate-lobed, and mainly opposite; the inconspicuous greenish flowers nearly sessile in the forks.

41. CRASSULACEÆ, ORPINE FAMILY.

Succulent plants, differing from the Saxifrage Family mainly in the complete symmetry of the flowers, the sepals, petals, stamens, and pistils equal in number, or the stamens of just double the number: the pistils all separate and forming as many (mostly many-seeded) little pods, except in Penthorum, where they are united together. (Lessons, p. 86, fig. 168 - 171.) Penthorum, which is not succulent, is just intermediate between this family and the foregoing. Several are monopetalous, i. e. have their petals united below into a cup or tube.

§ 1. *Leaves not at all fleshy, but thin and membranaceous: the 5 ovaries united into one 5-horned 5-celled pod: no scales behind the ovaries.*

1. PENTHORUM. Sepals 5. Petals 5, small, or usually none. Stamens 10. Pod opening by the falling away of the 5 beaks, many-seeded. Rarely the parts are in sixes or sevens.

§ 2. *Leaves thickened and succulent: ovaries separate, a minute scale behind each.*

* *Petals separate: sepals nearly so or united at the base.*

2. SEMPERVIVUM. Sepals, narrow petals, and pistils 6 - 12 or even more, and stamens twice as many. Plants usually multiplying by leafy offsets, on which the leaves are crowded in close tufts like rosettes.

3. SEDUM. Sepals, narrow petals, and pistils 4 or 5; the stamens twice as many, the alternate ones commonly adhering to the base of each petal.
4. TILLÆA. Sepals, petals, stamens, and few-seeded pistils 3 or 4. Very small annuals, with axillary flowers.
5. CRASSULA. Sepals or lobes of the calyx, petals, stamens, and many-seeded pistils 5. Perennial herbs or fleshy-shrubby plants, with flowers in cymes or clusters.

* * *Petals united by their edges below, and bearing the stamens.*

\+ *Calyx 5-cleft or 5-parted: pistils 5.*

6. ROCHEA. Corolla salver-form, longer than the calyx. Stamens 5.
7. COTYLEDON. Corolla urn-shaped, bell-shaped, or cylindrical, sometimes 5-angled. Stamens 10.

\+ + *Calyx and corolla both 4-lobed at summit: pistils 4.*

8. BRYOPHYLLUM. Calyx inflated; the lobes of the corolla at length projecting and spreading. Stamens 8, projecting. Leaves opposite, petioled, simple or odd-pinnate, crenate.

1. PÉNTHORUM, DITCH STONE-CROP. (Name from the Greek, apparently alluding to the parts of the flower being in fives.) ♃

P. sedoìdes. Wet places, especially by roadsides: a homely weed, about 1° high, with alternate lanceolate and serrate leaves, and yellowish-green inconspicuous flowers loosely spiked on one side of the branches of an open cyme, all summer and autumn.

2. SEMPERVÌVUM, HOUSELEEK. (Latin for *live-for-ever.*) ♃

S. tectòrum, COMMON or ROOF HOUSELEEK, the plant in Europe usually grown upon roofs of houses: propagating abundantly by offsets on short and thick runners; leaves of the dense clusters oval or obovate, smooth except the margins, mucronate; those on the flowering stems scattered, oblong, clammy-pubescent, as well as the clustered purplish or greenish flowers; sepals, petals, and pods mostly 12. Cult. in country gardens, and on walls, roofs, &c.: rarely flowering, in summer.

3. SÈDUM, STONE-CROP, ORPINE. (Old name, from *sedeo,* to sit, i. e. upon rocks, walls, &c., upon which these plants often flourish, with little or no soil.) The following are all smooth perennials, and hardy N. except the first species.

§ 1. *Leaves flat and broad, oblong, obovate, or rounded,*

* *The lower ones at least whorled in threes.*

S. Siebóldii, SIEBOLD'S S. Cult. from Japan, mostly in pots; with slender and weak or spreading stems, glaucous and mostly reddish-tinged round and often concave leaves (1′ or less long), with a wedge-shaped base and wavy-toothed margin, all in whorls up to the cyme of rosy-purple flowers, which all have their parts in fives.

S. ternàtum, THREE-LEAVED S. Wild in rocky woods from Penn. S. & W., and common in gardens; with spreading stems creeping at base and rising 3′ – 6′ when they blossom; the lower leaves wedge-obovate and whorled; the upper oblong and mostly scattered, about ½′ long; flowers white, the first or central one with parts generally in fives, the others sessile along the upper side of the usually 3 spreading branches and mostly with their parts in fours; in late spring.

* * *All or most of the leaves alternate: flowers in a corymb-like terminal cyme, purple or purplish, in summer, all with their parts in fives.*

S. Telèphium, GARDEN ORPINE or LIVE-FOR-EVER. Cult. from Eu. in old country gardens: erect, about 2° high, with oval and mostly wavy-toothed pale and thick leaves, small and dull-colored flowers in a compound cyme, and short-pointed pods.

S. telephioìdes, WILD O. or L. Dry rocks on mountains, chiefly along the Alleghanies; 6′ – 12′ high, very like the last, but with fewer flowers, and pods tapering into a slender style.

§ 2. *Leaves narrow and thick, barely flattish or terete: low or creeping plants.*

S. àcre, Mossy S., or Wall-Pepper. Cult. from Eu., for edgings and rock-work, running wild in some places: a moss-like little plant, forming mats on the ground, yellowish-green, with very succulent and thick ovate small and crowded leaves, and yellow flowers in summer, their parts in fives.

S. pulchéllum, Beautiful S. Wild S. W. on rocks; also cult. in gardens, &c.; spreading and rooting stems 4′–12′ long; leaves crowded, terete, linear-thread-shaped; flowers rose-purple, crowded on the upper side of the 4 or 5 spreading branches of the cyme, their parts mostly in fours, while those of the central or earliest flower are in fives: in summer.

S. cárneum, variegàtum. Cult. of late for borders, &c., of unknown origin; has creeping stems, and the small leaves mostly opposite, sometimes in threes, linear, flattish, acute, very pale green, and white-edged: flowers not yet seen.

4. TILLÆA. (Named for an Italian botanist, *Tilli.*) Fl. all summer. ①

T. símplex, is a minute plant of muddy river-banks along the coast, spreading and rooting, only 1′–2′ high, with linear-oblong opposite leaves, and solitary inconspicuous white flowers sessile in their axils.

5. CRÁSSULA. (So named from the incrassated leaves.) House-plants, occasionally cult., from Cape of Good Hope. ♃

C. arboréscens. Fleshy shrub, with glaucous roundish-obovate leaves (2′ long) tapering to a narrow base, and dotted on the upper face; the flowers rather large and rose-colored.

C. láctea, has greener and narrower-obovate leaves, connate at the base in pairs, and a panicle of smaller white flowers.

C. falcàta, has slightly woody stems, oblong and rather falcate or curved leaves connate at base, 3′–4′ long, powdery-glaucous, and a compound cyme of many red sweet-scented flowers, the petals with erect claws partly united below, and spreading abruptly above; so that the plant has been placed under the next genus, and named Rochea falcata.

6. RÒCHEA. (Named for a Swiss physician, *Laroche.*) Half-shrubby succulent house-plants of the Cape of Good Hope. ♃

R. coccínea. Stems 1°–2° high, thickly beset with the oblong-ovate (1′ long) leaves up to the terminal and umbel-like sessile cluster of handsome flowers; tube of the scarlet-red corolla 1′ long.

7. COTYLÈDON. (From Greek word for a *shallow cup.*) House-plants, not common. ♃

C. orbiculàta. Half-shrubby succulent plant, from Cape of Good Hope, with opposite white-powdery or glaucous wedge-obovate leaves (2′–4′ long), and a cluster of showy red flowers (nearly 1′ long) raised on a slender naked petiole, the cylindraceous tube of the corolla longer than the recurved lobes.

C. (or **Echevèria**) **coccínea,** from Mexico, is shrubby at base, with the wedge-obovate acute leaves in rosettes, and alternate and scattered on the flowering stems; flowers in a leafy spike, the 5-parted corolla not longer than the spreading calyx, 5-angled at base, red outside, yellow within.

8. BRYOPHÝLLUM. (Name of Greek words for *sprout* or *bud* and *leaf.*) ♃

B. calycìnum. A scarcely shrubby succulent plant, originally from tropical Africa, cult. in houses, &c., with opposite petioled leaves, 3 or 5 pinnate leaflets, or the upper of single leaflets, and an open panicle of large and rather handsome hanging green flowers tinged with purple: the calyx is oblong and bladdery; out of it the tubular corolla at length projects, and has 4 slightly spreading acute lobes; the leaflets oval, 2–3 inches long, crenate; when laid on the soil, or kept in a moist place, they root and bud at the notches, and produce little plants. The name refers to the propagation of the plant in this way.

42. HAMAMELACEÆ, WITCH-HAZEL FAMILY.

Shrubs or trees, with alternate simple leaves, deciduous stipules, small flowers in heads, spikes, or little clusters, the calyx united below with the base of the 2-styled ovary, which forms a hard or woody 2-celled and 2-beaked pod, opening at the summit. Stamens and petals when present inserted on the calyx. Three wild plants of the country, belonging to as many genera.

§ 1. *Shrubs, with perfect or merely polygamous flowers, a regular calyx, and a single ovule, becoming a bony seed, suspended from the top of each cell.*

1. HAMAMELIS. Flowers in small clusters in the axils of the leaves, expanding late in autumn, ripening the seeds late the next summer. Calyx 4-parted. Petals 4, strap-shaped. Stamens 8, very short; the 4 alternate with the petals bearing anthers, the 4 opposite them imperfect and scale-like. Styles short. Pod with an outer coat separating from the inner.
2. FOTHERGILLA. Flowers in a scaly-bracted spike, in spring, rather earlier than the leaves. Calyx bell-shaped, slightly 5–7-toothed. Petals none. Stamens about 24, rather showy, the long and club-shaped filaments bright white. Styles slender. Pod hairy.

§ 2. *Tree, with monœcious small flowers, in dense heads or clusters, destitute both of calyx and corolla, the fertile with many ovules in each cell, but only one or two ripening into scale-like seeds.*

3. LIQUIDAMBAR. Heads of flowers each with a deciduous involucre of 4 bracts, the sterile in a conical cluster, consisting of numerous short stamens with little scales intermixed; the fertile loosely racemed or spiked on a drooping peduncle, composed of many ovaries (surrounded by some little scales), each with 2 awl-shaped beaks, all cohering together and hardening in fruit.

1. HAMAMÈLIS, WITCH-HAZEL. (An old Greek name of Medlar, inappropriately transferred to this wholly unlike American shrub.)

H. Virgínica. Tall shrub, of damp woods, with the leaves obovate or oval, wavy-toothed, straight-veined like a Hazel, slightly downy; the yellow flowers remarkable for their appearance late in autumn, just as the leaves are turning and about to fall. Seeds eatable.

2. FOTHERGÍLLA. (Named for *Dr. Fothergill* of London, a friend and correspondent of Bartram.)

F. alnifòlia. Low, rather ornamental shrub, in swamps, from Virginia S., with oval or obovate straight-veined leaves, toothed at the summit and often hoary beneath, the white flowers in spring.

3. LIQUIDÁMBAR, SWEET-GUM TREE or BILSTED. (Names allude to the fragrant terebinthine juice or balsam which exudes when the trunk is wounded.)

L. Styracíflua, the only species of this country: a large and beautiful tree in low grounds, from S. New England to Ill. and especially S., with fine-grained wood, gray bark forming corky ridges on the branches, and smooth and glossy deeply 5–7-lobed leaves, which are fragrant when bruised, changing to deep crimson in autumn, their triangular lobes pointed and beset with glandular teeth: greenish flowers appearing with the leaves in early spring.

43. HALORAGEÆ, WATER-MILFOIL FAMILY.

Contains a few insignificant aquatic or marsh plants, with small greenish flowers sessile in the axils of the (often whorled) leaves or bracts, and a single ovule and seed suspended in each of the 1–4 cells of the ovary.

1. MYRIOPHYLLUM. Flowers mostly monœcious, with sepals or teeth of the calyx, petals when there are any, lobes and cells of the ovary and nut-like fruit, and the sessile stigmas each 4; the stamens 4 or 8.
2. PROSERPINACA. Flowers perfect, with lobes of the calyx, stamens, stigmas, and cells of the 3-angled nut-like fruit each 3: petals none.
3. HIPPURIS. Flowers mostly perfect, with truncate calyx not continued above the adherent ovary, and a single stamen, slender style, and seed.

1. MYRIOPHYLLUM, WATER-MILFOIL. (Botanical name, from the Greek, like the popular name, means *thousand-leaved.*) Plants usually all under water, except their flowering tips; all but the uppermost or emerging leaves pinnately dissected into fine hair-like divisions. Fl. summer. ♃

M. spicàtum. Leaves whorled in threes or fours, those at the summit of flowering stems reduced to small ovate bracts shorter than the flowers, which therefore form an interrupted spike; petals deciduous; stamens 8; fruit smooth.

M. verticillàtum. Like the first, but the uppermost leaves longer than the flowers and pinnatifid.

M. heterophýllum. Chiefly W. & S.; with leaves whorled in fours or fives, those under the flowers ovate or lanceolate and serrate or merely pinnatifid; stamens and petals 4; fruit roughish on the back.

M. scabràtum. Chiefly S. & W.; with leaves and flowers as in the preceding, but more slender, the leaves under the flowers linear and cut-toothed, and the lobes of the fruit 2-ridged and roughened on the back.

M. ambíguum. Common only E.: with mostly scattered very delicate or capillary leaves, often perfect flowers, 4 petals and 4 stamens, and a minute smooth fruit.

2. PROSERPINÀCA, MERMAID-WEED. (Name from Latin *proserpo, to creep,* or after *Proserpine.*) *Stems creeping at base in the mud or* shallow water, the upper part emerging: flowers in the axils of the alternate leaves, produced all summer. ♃

P. palùstris. Leaves above water lanceolate and merely serrate; fruit sharply 3-angled.

P. pectinàcea. Leaves all pinnately divided into very slender divisions; angles of the fruit bluntish. Chiefly E. & S.

3. HIPPÙRIS, MARESTAIL (which the botanical name means in Greek).

H. vulgàris. In ponds and springs N. & W., but rare: stems 1°–2° high, the linear acute leaves in whorls of 8–12, the upper ones with minute flowers in their axils. ♃

44. ONAGRACEÆ, EVENING-PRIMROSE FAMILY.

Herbs, or sometimes shrubs, without stipules; the parts of the symmetrical flowers *in fours (rarely in twos to fives) throughout;* the tube of the calyx usually prolonged more or less beyond the adherent ovary, its lobes valvate in the bud, its throat bearing the petals (convolute in the bud) and the as many or twice as many stamens; styles always united into one. Embryo filling the seed: no albumen. Comprises many plants with showy blossoms, cultivated for ornament; these almost all American. (Lopezia has irregular flowers with only one perfect stamen.)

§ 1. *Parts of the flower in twos.*

1. CIRCÆA. Delicate low herbs, with opposite thin leaves, and very small whitish flowers in racemes. Calyx with 2 reflexed lobes, its tube slightly prolonged beyond the 1–2-celled ovary, which becomes a 1–2-seeded little bur-like indehiscent fruit, covered with weak hooked bristles. Petals 2, obcordate. Stamens 2. Style slender, tipped with a capitate stigma.

§ 2. *Parts of the flower in fours, or fives in No. 8.*

* *Ovary and dry nut-like fruit with a single ovule or seed in each cell.*

2. GAURA. Herbs with alternate sessile leaves, and small or smallish flowers in racemes or spikes Calyx with slender tube much prolonged beyond the 4-celled ovary. Petals 4, on claws, mostly turned toward the upper side of the flower. Stamens 8, these and the long style turned town. A little scale before each filament. Fruit small, 4-angled or ribbed, 1 - 4-seeded.

* * *Ovary and fruit with many ovules and seeds in each of the cells.*

+- *Herbs: fruit a chiefly 4-celled and 4-valved dry pod.*

++ ++ *Seeds furnished with a coma or tuft of long and soft hairs at one end, by which they are widely dispersed by the wind.*

3. EPILOBIUM. Calyx with tube scarcely at all extended beyond the linear ovary. Petals 4. Stamens 8.
4. ZAUSCHNERIA. Calyx extended much beyond the linear ovary into a funnel-shaped tube, with an abruptly inflated base where it joins the ovary, and with 4 lobes as long as the 4 oblong-obcordate petals, both of bright scarlet color. Stamens 8 and, as well as the long style, projecting.

++ ++ *Seeds naked, i. e. without a downy tuft.*

= *Flowers regular and symmetrical: calyx-tube extended more or less beyond the ovary, the lobes mostly reflexed: petals 4.*

5. CLARKIA. Calyx-tube continued beyond the ovary into a short funnel-form cup. Petals broad, wedge-shaped or rhombic, sometimes 3-lobed, raised on a slender claw. Stamens 8, with slender filaments, the alternate ones shorter: anthers curved or coiled after opening, those of the short stamens much smaller, or deformed and sterile. Stigmas 4, oval or oblong. Pod linear and tapering upwards, 4-sided. Flowers never yellow.
6. EUCHARIDIUM. Calyx-tube much prolonged and slender beyond the ovary. Petals wedge-shaped and 3-lobed at summit, tapering into a short claw. Stamens only 4, on slender filaments. Stigmas 2 or 4. Pod oblong-linear. Seeds slightly wing-margined. Flowers never yellow.
7. ŒNOTHERA. Calyx-tube either much or little prolonged beyond the ovary. Petals usually obovate or obcordate, with hardly any claw. Stamens 8. Flowers yellow, purple or white.

= = *Flowers regular and symmetrical, but often without petals: the calyx-tube not in the least extended beyond the broad summit of the ovary, on which the green lobes mostly persist: style usually short: stigma capitate.*

8. JUSSIÆA. Stamens twice as many as the lobes of the calyx, petals, and cells of the pod: i. e. 8 or 10, rarely 12.
9. LUDWIGIA. Stamens as many as the lobes of the calyx and cells of the pod, almost always 4. Petals 4, often small, or none.

= = = *Flowers irregular and unsymmetrical: calyx-tube not extended.*

10. LOPEZIA. Flowers small. Calyx with 4 linear purplish lobes. Petals with claws, 4, turned towards the upper side of the flower, the two uppermost narrower and with a callous gland on the summit of the claw, and what seems to be a fifth small one (but is a sterile stamen transformed into a petal) stands before the lower lobe of the calyx. Fertile stamen only one with an oblong anther. Style slender: stigma entire. Pod globular.

+- +- *Shrubs: fruit a 4-celled berry.*

11. FUCHSIA. Flowers showy; the tube of the highly colored calyx extended much beyond the ovary, bell-shaped, funnel-shaped, or tubular, the 4 lobes spreading. Petals 4. Stamens 8. Style long and thread-shaped: stigma club-shaped or capitate.

1. CIRCÆA, ENCHANTER'S NIGHTSHADE. (Named from *Circe*, the enchantress, it is not obvious why; the plants are insignificant and inert, natives of damp woods, flowering in summer.) ♃

C. Lutetiàna, the common species, is 1° - 2° high, branching, with ovate and slightly toothed leaves, no bracts under the pedicels, the rounded little fruit 2-celled and beset with bristly hairs.

C. alpìna, common only N. or in mountainous regions, smooth and delicate, 3′ - 6′ high, with thin and heart-shaped coarsely toothed leaves, minute bracts, and obovate or club-shaped fruit 1-celled and soft-hairy.

2. GAÙRA. (Name in Greek means *superb*, which these plants are not; only one of them is worth cultivating.) Fl. all summer.

G. Lindheimèri, of Texas, cult. for ornament, nearly hardy N., about 3° high, hairy, with lanceolate sparingly toothed leaves, long weak branches producing a continued succession of handsome white flowers; the calyx hairy outside; petals nearly 1′ long. ♃

G. biénnis, the common wild species, 3° – 8° high, soft-hairy or downy, with oblong-lanceolate obscurely toothed leaves, small white or flesh-colored flowers, and downy fruit. ②

3. EPILÒBIUM, WILLOW-HERB. (Name compounded of three Greek words, meaning *violet on a pod.*) Fl. summer. The pods opening give to the winds great numbers of the downy-tufted seeds. ♃

§ 1. *Flowers large and showy, in a long spike or raceme, the widely spreading petals on short claws, the stamens and long style bent downwards, and the stigma of 4 long lobes: leaves alternate.*

E. angustifòlium, GREAT W. or FIRE-WEED. One of the plants that spring up abundantly, everywhere northward, where forests have been newly cleared and the ground burned over: tall (4° – 7° high) and simple-stemmed, smooth, with lanceolate leaves, and a long succession of pink-purple flowers.

§ 2. *Flowers small in corymbs or panicles terminating the branches, with petals, stamens, and style erect, a club-shaped stigma, and all the lower leaves opposite: stem 1° – 2° high.*

E. coloràtum. Almost everywhere in wet places, fl. through late summer and autumn, nearly smooth; with thin lance-oblong leaves generally with purple veins, and purplish petals deeply notched at the end and a little longer than the calyx.

E. mólle. In bogs N., less common, soft downy all over; leaves crowded, linear-oblong, blunt; petals rose-color, notched, 2″ – 3″ long.

E. palústre. In wet bogs N., slender, minutely hoary all over; leaves linear or lance-linear, nearly entire; petals purplish or white, small.

4. ZAUSCHNÈRIA. (Named for *Zauschner*, a Bohemian botanist.) ♃

Z. Califórnica. Cult. for ornament, from California, flowering through late summer and autumn, 1° – 2° high, the oval or lanceolate leaves and the pods with downy-tufted seeds resembling those of Epilobium; but the handsome scarlet flowers more like those of a Fuchsia: these are single and sessile in the axils of the upper and alternate leaves, or at length somewhat racemed, about 2′ long.

5. CLÁRKIA. (Named for *Capt. Clark*, who with Capt. Lewis made the first official exploration across the mountains to the Pacific, and brought home one of the species.) Herbs of Oregon and California, with alternate mostly entire leaves, and showy flowers in the upper axils, or the upper running into a loose raceme: cult. for ornament: fl. summer. ①

C. pulchélla. About 1° high, with narrow lance-linear leaves, deeply 3-lobed petals (purple, with rose-colored and white varieties), bearing a pair of minute teeth low down on the slender claw, the lobes of the stigma broad and petal-like. There is a partly double-flowered variety.

C. élegans. Fully 2° high, more commonly flowered in the conservatory, with long branches, lance-ovate or oblong leaves, the lower petioled, lilac-purple entire petals broader than long and much shorter than their naked claw, smaller lobes to the stigma, and a hairy ovary and pod.

6. EUCHARÍDIUM. (Name from the Greek, means *charming.*) ①

E. concínnum, of California, cult. for ornament; a low and branching plant, like a Clarkia in general appearance, except in the long tube to the calyx, and with ovate-oblong entire leaves on slender petioles, and middle-sized rose-purple or white flowers, in summer.

7. ŒNOTHÈRA, EVENING-PRIMROSE. (Name from Greek words for *wine* and *hunt*: application obscure.) Very many species, all originally American, and most of them from the U. S., especially from S. W. and W. The following are the principal common ones, both wild and cult. for ornament: fl. summer. (Pollen-grains loosely connected by cobwebby threads, strongly 3-lobed. See Lessons, p. 115, fig. 250.)

§ 1. *Stigmas 4, long and slender, spreading in the form of a cross: tube of the calyx beyond the ovary long and mostly slender.*

* YELLOW-FLOWERED EVENING-PRIMROSES, *properly so-called, the flowers opening (usually suddenly) in evening twilight, and fading away when sunshine returns, odorous; the yellow petals commonly obcordate.*

← *Stems elongated and leafy: pod cylindrical or spindle-shaped, sessile.* ① ②

Œ. biénnis, COMMON E. Wild in open grounds, and the large-flowered forms cult. for ornament; erect, 2° – 5° high, hairy or smoothish, with lance-oblong leaves entire or obscurely toothed, flowers at length forming a terminal leafy-bracted spike, and petals obcordate. Runs into several varieties, of which the largest and finest now cultivated is

Var. **Lamarckiàna,** from S. W., which is tall and stout, with corolla 3′ – 4′ in diameter: the sudden opening at dusk very striking.

Œ. rhombipétala. Wild on our western limits; more slender, hoary, 1° – 3° high, the rather small flowers with rhombic ovate and *acute* petals.

Œ. Drummóndii, cult. from Texas; has its stems spreading on the ground, and large flowers, like those of the first, in the upper axils, the lance-ovate leaves, &c. soft-downy.

Œ. sinuàta. Wild from New Jersey S., in sandy ground; low and spreading, hairy, with lance-oblong sinuate or pinnatifid leaves, small flowers in their axils, pale yellow petals turning rose-color in fading, and slender pods.

← ← *Stems short and prostrate or scarcely any: pod short, 4-winged.*

Œ. tríloba. Cult. from Arkansas: leaves pinnatifid and cut, like those of Dandelion, smooth, all in a tuft at the surface of the ground, on the short crown, which in autumn is crowded with the almost woody pyramidal-ovate narrowly 4-winged sessile pods, forming a mass 3′ – 5′ in diameter; flowers rather small, the slender tube of the calyx 4′ – 5′ long, its lobes about as long as the obscurely 3-lobed or notched pale-yellow petals, which turn purplish in fading. ① ②

Œ. Missouriénsis, the greener-leaved form also called Œ. MACROCÁRPA. Cult. from Missouri and Texas; finely hoary or nearly smooth, with many short prostrate stems 2′ – 12′ long from a thick woody root, crowded lanceolate entire leaves, very large and showy flowers in their axils, opening before sunset; the tube of the calyx somewhat enlarging upwards, 6′ – 7′ long; the bright-yellow corolla 4′ – 6′ across; pod with 4 very broad wings. ♃

* * WHITE-FLOWERED EVENING-PRIMROSES, *usually turning rose-colored in fading, some of them opening in the daytime: petals broadly obovate or obcordate: flower-buds commonly nodding.*

Œ. taraxicifòlia (probably a variety of Œ. ACAÙLIS), from Chili: rather hairy, at first stemless, at length forming prostrate stems, with pinnatifid or pinnate leaves, after the manner of Dandelion (as the name denotes), and very large flowers in the axils, tube of calyx 3′ – 4′ long, corolla 3′ – 5′ across, and a woody obovate and sharply 4-angled sessile pod. ②

Œ. speciòsa, Nutt., of Arkansas and Texas, not hardy in cult. N.; pubescent, with erect and branching stems 6′ – 20′ high, lance-oblong cut-toothed leaves, the lower mostly pinnatifid; flowers somewhat racemed at the summit, and opening in the daytime; calyx-tube rather club-shaped and not much longer than the ovary; corolla 3′ – 4′ across; pod club-shaped. ♃

(Œ. MARGINÀTA, a tufted mostly stemless species, with lanceolate and often pinnatifid toothed soft-hairy leaves, and peduncled oblong-cylindrical roughish pods; Œ. TRICHOCÀLYX, soft-hairy, conspicuously so on the calyx, with deeply obcordate petals, long-linear pods with a thicker closely sessile base and smooth seeds; Œ. ALBICAÙLIS, with ascending stems, smooth or slightly hoary,

smaller entire petals, but pods and seeds like the foregoing; and Œ. PINNATIFIDA, with petals as in Œ. trichocalyx, and similar pods, but with striate and reticulated seeds, — all handsome white-flowered species of Western plains and the Rocky Mountains, — are beginning to be cultivated.)

* * * YELLOW-FLOWERED, DIURNAL, *sometimes called* SUNDROPS, *the blossoms opening in bright sunshine: petals mostly obcordate: stems leafy: leaves obscurely toothed or entire. Wild species of the country, all but the last occasionally cultivated.* ♃

+ *Pod short-oblong or obovate, 4-wing-angled.*

Œ. glaùca. Wild from Virginia and Kentucky near and in the mountains S.: 1°–2° high, smooth, pale and glaucous, leafy to the top; leaves ovate or lance-ovate; corolla 2′ or more in diameter.

+ + *Pod club-shaped, somewhat 4-wing-angled above, and 4 intervening ribs.*

Œ. fruticòsa. Wild in open places: *not* shrubby, as the name would imply, hairy or nearly smooth, with oblong or lanceolate leaves, somewhat corymbed flowers 1½′–2′ in diameter, and short-stalked pods.

Œ. lineàris. Wild from Long Island S. near the coast: pale or somewhat hoary with minute pubescence, with slender and spreading often bushy-branched stems 1′–2′ long, linear or lance-linear leaves, and somewhat corymbed flowers, corolla 1′–1½′ across, and hoary pods tapering into a slender stalk. — A spreading form is cultivated, blooming very freely through the summer.

Œ. pùmila. In fields, &c.: nearly smooth, 5′–12′ high, with mostly simple erect or ascending stem, oblanceolate leaves, and scattered flowers, the corolla less than 1′ across, and pods short-stalked or sessile.

* * * * RED-PURPLE-FL., DIURNAL, *leafy-stemmed: pods club-shaped.* ① ②

Œ. ròsea, from Mexico. Minutely downy, with slender spreading stems 6′–24′ high, ovate or lance-oblong leaves, the lower sometimes rather pinnatifid, and flowers 1′ across in leafy racemes.

§ 2. GODÈTIA. *Stigma with 4 linear or short and broad lobes: tube of the calyx beyond the linear or spindle-shaped ovary inversely conical or funnel-shaped: leafy-stemmed: flowers open by day, scentless: petals broad and fan-shaped or wedge-shaped, the truncate summit generally eroded, lilac-purple, rose-color, or sometimes white: anthers erect on short (the alternate ones on very short) and broadish filaments, curving after opening. All W. American, abounding in Oregon and California, several in the gardens, the following most common.* ①

Œ. purpùrea. Very leafy to the top, rather stout, 6′–10′ high, at length with many short branches; leaves pale, lance-oblong, entire; corolla 1′–1½′ across, purple, with a dark eye; short and broad lobes of stigma dark-colored; pods short and thick, closely sessile, rather conical.

Œ. rubicùnda. Taller, 1°–2° high, and linear-lanceolate leaves rather scattered along the slender branches; corolla 2′ or more across, lilac-purple with saffron-colored eye (also pale or rose-colored varieties); lobes of stigma oblong, pale; pods thickish, cylindrical, sessile.

Œ. Líndleyi. Erect or spreading, 8′–16′ high, with slender branches, narrow lanceolate leaves; corolla about 2′ across, lilac-purple, with a deeper red-purple spot on the middle of each petal; lobes of the stigma linear and pale; pods slender, linear, somewhat tapering at the ends.

Œ. amœna. Slender, 6′–18′ high, with lance-oblong or lance-linear leaves, and corolla 2′–3′ across, rose-color or almost white, with usually a deeper reddish eye; lobes of stigma linear; pods linear.

8. JUSSIÆA. (Named for *Bernard*, the elder *de Jussieu.*) Leaves entire. Flowers yellow, all summer.

J. decúrrens. Wet grounds, Virg. to Ill. and S. Erect stems and slender branches margined or winged in lines proceeding from the bases of the lanceolate leaves, smooth throughout; flowers sessile or short-stalked, with 4 lobes of calyx nearly as long as the petals, and oblong-club-shaped 4-angled pod. ① ♃

J. grandiflòra. Marshes S.: hairy, with stems erect from a creeping base, lanceolate acute leaves, flowers 2′ in diameter, the 5 calyx lobes only half as long as the petals, and pods cylindrical and stalked. ♃

J. rèpens. In water from S. Ill. S.: smooth, with creeping or floating and rooting stems, oblong leaves tapering into a slender petiole, long-peduncled flowers 1′ or more across, with 5 calyx-lobes, the cylindrical or club-shaped pods tapering at the base. ♃

9. LUDWÍGIA, FALSE LOOSESTRIFE. (Named for *C. G. Ludwig*, a German botanist, rather earlier than Linnæus.) Marsh herbs, with entire leaves; flowers seldom handsome, in summer and autumn. ♃

§ 1. *Leaves alternate, mostly sessile.*

* *Flowers peduncled in the upper axils, with yellow petals (about ½′ long) equalling the leaf-like ovate or lance-ovate calyx-lobes: stamens and styles slender: pod cubical, strongly 4-angled, opening by a hole at the top: stems 2° – 3° high.*

L. alternifòlia. Common E., the only one found far N.: smoothish, branching, with lanceolate leaves tapering to both ends, petals scarcely longer than calyx, and angles of pod wing-margined.

L. virgàta. Pine barrens S.: downy, with mostly simple stems, blunt oblong leaves or the upper linear and smaller, and petals twice the length of the reflexed calyx.

L. hirtélla. Pine-barrens from New Jersey S.: hairy, with simple stems, oblong or lanceolate short and blunt leaves, and petals twice as long as the barely spreading calyx-lobes.

* * *Flowers sessile in the upper axils, small, and with pale yellow petals about the length of the persistent calyx-lobes: stamens and style short: leaves on flowering stems narrow and linear.*

L. lineàris. Swamps from N. Jersey S.: smooth, loosely branched, 1° – 3° high, with acute leaves on the flowering stems, but obovate ones on creeping runners; pods oblong-clubshaped or top-shaped and much longer than the triangular-ovate calyx-lobes.

L. linifòlia, only S., is 6′ – 12′ high, with blunter leaves, and cylindrical pods little longer than the lanceolate calyx-lobes.

* * * *Flowers sessile, often clustered, and with no petals, or rarely mere rudiments: leaves mostly lanceolate, some species with obovate or spatulate leaves on creeping runners: flowering stems mostly 2° – 3° high.*

+ *Downy all over: flowers spiked or crowded at the end of the branches.*

L. pilòsa. Only S.: much branched, with lance-oblong leaves, and globular-4-sided pod about the length of the spreading calyx-lobes.

+ + *Smooth or smoothish throughout.*

L. cylíndrica. From Illinois and N. Car. S.: much branched, with long lanceolate and acute leaves tapering into a petiole, small axillary flowers, and cylindrical pods much longer than the small calyx-lobes.

L. sphærocárpa. From E. New England S.: with lanceolate or linear leaves acute at both ends, very small flowers in the axils, and globular pods not longer than the calyx-lobes, with hardly any bractlets at their base.

L. polycárpa. From Michigan S.: like the last, but smoother, and with conspicuous slender bractlets at the base of the 4-sided rather top-shaped pod, which is longer than the calyx-lobes.

L. capitàta. From N. Carolina S.: with slender simple stems angled towards the top, long lanceolate leaves; flowers mostly crowded in an oblong or roundish terminal head, and obtusely 4-angled pod longer than the calyx-lobes.

L. alàta. From N. Carolina S.: with simple or sparingly branched stems strongly angled above, few flowers, in the axils of the upper wedge-lanceolate leaves, and an inversely pyramidal pod as long as the white calyx-lobes, with concave sides and winged angles.

L. microcárpa. From N. Carolina S.: the low stems creeping at base and 3-angled above, leaves spatulate or obovate, with minute flowers in their axils, the short 4-angled pods not larger than a pin's head.

§ 2. *Leaves opposite, obovate or spatulate, long-petioled, with small and nearly sessile flowers in their axils : stems creeping or floating.*

L. palústris. Common in ditches and shallow water : smooth, with no petals, or small and reddish ones when the plant grows out of water, and oblong obscurely 4-sided pods longer than the very short calyx-lobes.

L. nàtans. From N. Carolina S. : larger than the foregoing, and with yellow petals as long as the calyx-lobes, the pods tapering to the base.

§ 3. *Leaves opposite, nearly sessile, with a long-peduncled flower in the axil of some of the upper ones : stems creeping in the mud.*

L. arcuàta. From coast of Virginia S. : a small and smooth delicate plant, with oblanceolate leaves shorter than the peduncle, yellow petals longer than the slender calyx-lobes, and club-shaped somewhat curved pod.

10. LOPÈZIA. (Named for *T. Lopez*, an early Spanish naturalist.)

L. racemòsa. Cult. sparingly, from Mexico : a slender, branching, nearly smooth plant, with alternate ovate or lance-oblong leaves on slender petioles, the branches terminated with loose racemes of small rose-pink or sometimes white flowers (only ¼′ in diameter), on slender pedicels from the axil of leafy bracts, produced all summer, followed by very small round pods. ①

11. FÙCHSIA. (Named for *L. Fuchs*, an early German botanist.) Well-known ornamental tender shrubby plants, or even trees, chiefly natives of the Andes from Mexico to Fuegia, mostly smooth, with opposite or ternately whorled leaves. The species in cultivation, now greatly mixed and varied, chiefly come from the following.

§ 1. Short-flowered Fuchsias, or Ladies' Eardrops ; *with the lobes of the normally red calyx longer than the tube and than the petals ; the latter normally violet or blue, obovate and retuse, convolute around the base of the projecting filaments and still longer style : flowers hanging on long peduncles from the axils of the leaves.*

F. coccínea, or F. globòsa. Low, the rather small scarlet flowers with globular or ovoid calyx-tube between the ovary and the lobes, which also form a globular bud and hardly spread after opening ; leaves short-petioled.

F. Magellánica, from S. Chili and Fuegia : less tender, with tube of the calyx bell-shaped and much shorter than the lobes ; leaves short-petioled or the upper sessile.

F. macrostémma, from Chili : leaves on slender petioles ; calyx-tube oblong or short-cylindrical, more or less shorter than the spreading lobes. — These species now greatly varied in color ; some varieties with calyx white or light and the petals deeply colored, some with the reverse ; also double-flowered, the petals being multiplied.

§ 2. Long-flowered Fuchsias ; *with trumpet-shaped or slightly funnel-shaped tube of the calyx 2′ – 3′ long, very much longer than the spreading lobes, which little exceed the acute or pointed somewhat spreading petals : stamens and style little projecting : flowers crowded into a rather close drooping raceme or corymb at the end of the branches : leaves large, 5′ – 7′ long.*

F. fúlgens, from Mexico : smooth, with ovate somewhat heart-shaped leaves, and scarlet flowers, the lance-ovate calyx-lobes often tinged with green.

F. corymbiflòra, from Peru : mostly pubescent, with lance-oblong and taper-pointed almost entire leaves, and red flowers, the lanceolate calyx-lobes and the lance-oblong petals taper-pointed, at length widely spreading.

§ 3. Panicled Fuchsias ; *with small flowers erect in a naked and compound terminal panicle or cluster : lobes of the calyx and petals widely spreading.*

F. arboréscens, Tree F., from Mexico : a stout shrub rather than tree, with oblong or lance-oblong entire leaves acute at both ends and usually whorled ; flowers light rose-color, ½′ long, with narrow oblong calyx-lobes, and petals rather longer than the tube, about as long as the stamens and style.

45. MELASTOMACEÆ, MELÀSTOMA FAMILY.

Plants with opposite and simple 3 – 7-ribbed leaves, no stipules, as many or twice as many stamens as petals, both inserted in the throat of the calyx, anthers usually of peculiar shape and opening by a small hole at the apex. Flowers usually handsome, but mostly scentless. A large order in the tropics, represented in northern temperate regions only by the genus Rhexia of the Atlantic States. None in common cultivation, but the following are those more usually met with in choice conservatories: —

Centradènia ròsea, from Mexico: a low and bushy almost herbaceous plant, with unequal-sided and falcate broadly lanceolate leaves, apparently *alternate* (which comes from the diminution or total suppression of one leaf of each pair), producing great abundance of small flowers in short raceme-like clusters, with 4 white and rose-tinged petals, and 8 anthers with curious club-shaped and tail-like appendages.

Heterocéntron ròseum, from Mexico: an herb, or nearly so, with thin ovate leaves which are *feather-veined* rather than ribbed, and with terminal panicles of handsome bright rose-colored flowers (and a white variety), of 4 petals and 8 very unequal and dissimilar stamens, some with appendages at base, some without.

Cyanophýllum metállicum, from Central America, cultivated in hothouses for its magnificent foliage; the ovate leaves sometimes fully two feet long, purple beneath and bluish above with metallic lustre. — Then we have the U. S. genus,

1. RHÉXIA, DEER-GRASS, MEADOW-BEAUTY. (Name from Greek for *rupture*: application obscure.) Low erect herbs of wet or sandy ground, commoner S., often bristly, at least on the margins of the sessile 3 – 5-ribbed leaves, with handsome flowers in a terminal cyme or panicle. Tube of the calyx urn-shaped, adherent to the lower part of the 4-celled ovary and continued beyond it into a short 4-toothed cup, persistent. Petals 4, obovate. Stamens 8, with anthers opening by a single minute hole. Style slender: stigma simple. Seeds numerous in the pod, coiled like minute snail-shells. Fl. summer. ♃

* *Anthers linear and curved, with a sac-like base and usually a minute spur: flowers in a panicle or loose cyme.*

R. Virgínica. The common species N., in sandy swamps: 6′ – 20′ high, with square stem almost winged at the angles, ovate or lance-oval sessile leaves, and large pink-purple flowers.

R. Mariàna. From New Jersey and Kentucky S.: 10′ – 24′ high, with terete or 6-angled branching stem, linear or lance-oblong leaves narrowed at base, and paler purple flowers hairy outside.

R. glabélla. Pine-barrens S.: smooth, with a simple slender stem, lanceolate glaucous leaves, and large bright-purple flowers.

* * *Anthers oblong and straight, destitute of any appendage.*

+ *Flowers purple, few or solitary: leaves small (rarely 1′ long), rounded-ovate, ciliate with long bristles: stem square, smooth.*

R. ciliòsa. Bogs in pine barrens from Maryland S.: stem 10′ – 12′ high; leaves bristly on the upper face; and calyx smooth.

R. serrulàta. Bogs in pine barrens wholly S.: stem 3′ – 6′ high; leaves smooth above; calyx bristly.

+ + *Flowers yellow, small, numerous, not casting the petals early, as do the others: stem 4-angled, bristly, bushy-branched above.*

R. lùtea. From North Carolina S. & W.: stem 1° high, bristly; leaves lanceolate, or the lower obovate; calyx smooth.

46. MYRTACEÆ, MYRTLE FAMILY.

Trees or shrubs, with simple entire and mostly aromatic leaves punctate with pellucid or resinous dots, no stipules, perfect flowers, calyx-tube adherent to the ovary, its throat, or a disk bordering it, bearing the petals and numerous stamens: style and stigma single. A large family in the tropics and southern hemisphere, here commonly known only by a few house-plants, which may be briefly noted as follows: —

1. **Mýrtus commùnis,** COMMON MYRTLE, from the Mediterranean region: smooth, with ovate or lance-ovate opposite shining leaves, small in the variety usually cultivated, peduncles in their axils bearing a small white or rose-tinged flower (sometimes full double), followed by a black berry, containing several kidney-shaped seeds.

2. **Eugènia Jámbos,** ROSE-APPLE, from India: smooth, with opposite shining long and lanceolate leaves, and clusters of large white flowers with their long stamens most conspicuous; the calyx-tube dilated and prolonged beyond the ovary, which forms a large edible berry, like a small apple, scentless, but when eaten of a rose-like savor; seeds very few, large.

3. **Psídium pyríferum,** GUAVA, of W. Ind.: with oval feather-veined opposite leaves, and one or two white flowers at the end of an axillary peduncle; the fruit a large and pear-shaped yellowish berry which is eatable, and from which *Guava jelly* is made in the West Indies.

4. **Callistèmon lanceolàtum,** of Australia, called BOTTLE-BRUSH, on account of the appearance of the flowers (sessile all round the stem below the later leaves) with their very long deep red stamens; the 5 petals small and falling early; the fruit a small many-seeded pod opening at the top; the alternate lanceolate leaves remarkable for being turned edgewise by a twist at their base, as in many related Myrtaceous plants of Australia.

47. LYTHRACEÆ, LOOSESTRIFE FAMILY.

Differs from the related orders in having the ovary and pod free from, but mostly enclosed in, the tube of the calyx, the leaves not punctate, the anthers opening lengthwise. To this family has lately been appended the Pomegranate, which, although peculiar, is commonly referred to the Myrtle Family, notwithstanding the dotless leaves.

§ 1. *Ovary coherent with the calyx-tube, becoming a fleshy fruit. Small tree.*

1. PUNICA. Calyx-tube colored (scarlet), thick and coriaceous, its top-shaped base coherent with the ovary, above enlarged and 5–7-lobed; its throat bearing the 5–7 petals and very many incurved stamens. Style slender. Ovary with many cells in two sets, one above the other, and very many ovules in each. Fruit large, globular, crowned with the calyx-lobes, berry-like, but with a hard rind: the numerous seeds coated with a juicy edible pulp.

§ 2. *Ovary free from the calyx-tube, becoming a 1–6-celled pod.*

* *Stamens indefinitely numerous. Small tree.*

2. LAGERSTRŒMIA. Calyx 6-lobed. Petals 6, very wavy-crisped, raised on slender claws, borne on the throat of the calyx. Stamens borne in the bottom of the calyx, very long and slender, 6 outermost larger than the rest. Style very slender. Pod oblong, thick, many-seeded, 3–6-celled, only the base covered by the persistent calyx.

* * *Stamens 4–16, only as many or twice as many as the lobes of the calyx, inserted lower down than the petals. Herbs or nearly so: calyx mostly with projecting folds, or accessory teeth between the proper teeth or lobes.*

M. Líndleyi. Cultivated, from California, usually under the name of Bartónia aúrea. Plant 1° – 2° high, with leaves lance-ovate in outline and deeply pinnatifid, their lobes linear; flowers with 5 obovate and pointed bright yellow petals opening in sunshine, and the very numerous filaments all slender ①

M. ornàta, the Bartònia ornàta of Nuttall, a very large-flowered species, of the plains of Nebraska and S.: 2° – 4° high, with oblong-lanceolate sinuate-pinnatifid leaves, and white fragrant flowers opening at sunset or on a cloudy afternoon, leafy-bracted under the ovary, and with 10 lance-ovate or spatulate acute petals, about 2′ long, the 5 inner narrower, and the 200 – 300 filaments all slender; seeds very many and flat. Rarely cult. for ornament, but well worthy of it. ② ♃ ?

M. nùda, the Bartònia nùda of Nuttall, of the same district and further south, and less rare in cultivation than M. ornata, resembles it, but has flowers of half the size and often without leafy bracts under the ovary; outer filaments mostly broadened; seeds wing-margined. ② ♃ ?

§ 3. Eucnìde of Zuccarini *Pod short, containing very many minute roundish or oblong seeds: flowers showy, yellow, opening in bright sunshine.*

M. lóngipes. Cult. from Mexico and Texas under the name of Eucnìde bartonioìdes; a tender succulent plant, branching and usually spreading on the ground, bristly, with ovate cut-toothed or slightly lobed leaves on slender petioles, and flowers mostly on still longer simple peduncles (3′ – 6′ long), the 5 ovate petals and very many slender filaments fully 1′ long. ①

2. BLUMENBÁCHIA. (Named for the distinguished German physiologist, *Blumenbach*. Includes Caióphora. Fl. all summer.

B. insígnis. Cult. from Chili; rather curious than ornamental, with palmately about 5-parted leaves, small flowers with white petals and yellow red-tipped inner appendages; the pod obovate, slightly twisted, with 5 strongly projecting placentæ. ①

B. laterítia. Cult. from South America, under the name of Loàsa or Caióphora laterítia; climbing freely; with pinnatifid or pinnate leaves of 5 or more lance-ovate divisions or leaflets, which are cut-toothed or some of them again pinnatifid; flowers almost 2′ across, with brick-red petals; the long pod at length much twisted. ①

49. CACTACEÆ, CACTUS FAMILY.

Fleshy plants of peculiar aspect, mostly persistent, destitute of foliage (with exception of the rare Pereskia), its place supplied by the green rind of the flattened, columnar, globular, or various-shaped stem; the perfect solitary and sessile flower with calyx adherent to the ovary, its lobes or sepals, the petals, and the stamens numerous, usually in several ranks, the latter mostly very numerous; ovary 1-celled with several parietal placentæ; style single, with several stigmas; the fruit a 1-celled and generally many-seeded pulpy berry. (See Lessons, p. 48, fig. 76, and p. 96, fig. 197.)

We have three or four wild species, several others in common house-cultivation, and a larger number in choice collections, some of which are hybrids.

§ 1. *No tube to the flower above the ovary: stem jointed.*

1. OPUNTIA. Stem branching, formed of successive joints, which are mostly flat, bearing at first some minute awl-shaped bodies answering to leaves, which soon fall off, and tufts of barbed bristles and often prickles also in their axils. Flowers from the edge or side of a joint, opening in sunshine and for more than one day.

§ 2. *Tube formed of the united sepals, &c. more or less extended beyond the ovary.*

* *Stems and branches of flat and leaf-like joints, with the margins more or less toothed or crenate, and with an evident woody centre or midrib, with no prickles and no bristles, or only tufts of very short ones in the notches.*

2. EPIPHYLLUM. Joints of the branches short and truncate, very smooth, and flowering from the end. Flowers open in the daytime and for several days, mostly oblique, the tube not much lengthened; the sepals and petals rose-red, rather few, the innermost and larger ones about 8. Stamens not very many. Stigmas erect or conniving.

3. PHYLLOCACTUS. Leaf-like branches or joints long, arising from the side of older ones, which with age form terete stems. Flowers from the marginal notches, slightly if at all irregular. Stigmas slender and spreading.

* * *Stems or branches 3 – many-angled or grooved, or terete, and with tubercles or woolly tufts bearing a cluster of spines, prickles, or bristles.*

4. CEREUS. Stem mostly elongated, rarely globular, regularly ribbed or angled lengthwise, and with the clusters of spines or bristles on the ridges one above the other. Flowers from the side of the stem, commonly with a conspicuous tube, which, with the ovary below, is beset with scale-like sepals and generally with woolly or bristly tufts in their axils. Petals numerous and spreading.

5. ECHINOCACTUS. Stem globular, depressed, or sometimes oblong-club-shaped, with many ribs or ridges bearing clusters of spines one above the other. Flowers naked at the summit of the ridges, and with a short or very short tube: otherwise as in Cereus.

6. MELOCACTUS. Stem globular with a broad base, or conical, with many ribs bearing clusters of spines as in Echinocactus; but the flowers small and immersed in a woolly cylindrical muff-like mass at the summit. Sepals and petals united in a cylindrical tube, which is often swollen at the base. Filaments short. Ovary and berry not scaly.

7. MAMILLARIA. Stems globular or cylindrical, mostly tufted, not ribbed, covered with distinct and strongly projecting nipple-shaped tubercles, which are arranged in spiral order and tipped with a cluster of prickles. Flowers from the axils of the tubercles, with a short tube. Ovary and berry not scaly.

1. OPÚNTIA, PRICKLY-PEAR CACTUS, INDIAN FIG, &c. (An ancient name, transferred to these American plants.) Fl. summer. Fruit often eatable.

§ 1. *Stamens not longer than the roundish, in ours yellow, widely opening petals.*

* *Low, prostrate or spreading, native species, also cultivated.*

O. vulgàris, COMMON PRICKLY-PEAR. On rocks and sand, from coast of New England S., with pale and rounded-obovate flat joints, 3′ – 6′ long, bearing minute appressed leaves, having bristles but hardly any spines in their axils, and a nearly smooth eatable berry.

O. Rafinésquii. Common W. & S. W.: deeper green, with joints 4′ – 8′ long, the little leaves spreading, several small spines and a single stronger one in the clusters, and flower often with a reddish centre.

O. Missouriénsis. From Wisconsin W. on the plains: with obovate joints 2′ – 4′ long and tubercled, tufts of straw-colored bristles and 5 – 10 long and slender spines; the berry dry and prickly.

O. Pes-Córvi. On the coast S., with small and narrow, almost cylindrical, easily separable joints, their spines in pairs; the berry small and bristly.

* * *Erect, shrubby or tree-like, cultivated in conservatories, from West Indies and South America: berry edible.*

O. Ficus-Índica. Joints obovate, thick and heavy, 1° long, with minute spines or none; berry obovate, bristly.

O. Tùna. Joints oval, 4′ – 8′ long, with several unequal spines in the tufts, the longer ones about 1′ long.

O. Brasiliénsis. Tree-like, with a round straight trunk rising 10° or more high, bearing short branches, their ultimate joints obovate or oblong, sinuate, thinner and more leaf-like than in the others, armed with single long and very sharp spines.

§ 2. *Stamens longer than the erect crimson petals, shorter than the style.*

O. coccinellífera. Cult. from Mexico and West Indies: tree-like, 6°–10° high, with joints of the branches obovate-oblong, 4′–12′ long, spineless or nearly so, when young with single recurved spines, pale; berry red. One of the plants upon which the cochineal insect feeds, whence the name.

2. EPIPHÝLLUM. (Name from Greek, meaning *upon a leaf*, i. e. the flower from the top of what seems to be a leaf.) Fl. usually in summer.

E. truncàtum. Cult. from Brazil: low, bright green, with drooping branches; the oblong joints scarcely 2′ long, the upper end with a shallow notch; flower 2–3′ long, oblique, with petals and short sepals spreading or recurved, the former so arranged that the blossom often appears as if 2-lipped.

3. PHYLLOCÁCTUS. (From Greek words meaning *Leaf-Cactus.*) Cult. from South America and Mexico: fl. summer.

* *Flower with tube shorter than the petals, red, scentless, open through more than one day: petals and stamens many, except in the first species.*

P. bifórmis. The least showy species; with slender stems, and two sorts of branches, one ovate or oblong, the other lanceolate; the latter producing a slender pink flower, 2′ long, with about 4 slender sepals, as many narrow lanceolate erect petals with spreading tips, and only 8–16 stamens.

P. phyllanthoìdes. Has narrow-oblong sinuate-toothed leaf-like branches, numerous rose-colored oblong and similar sepals and petals, the outermost widely spreading, the innermost erect.

P. Ackermánni. Like the preceding, but much more showy, with bright red and sharp-pointed petals spreading and 2′–3′ long, and the scattered sepals small and bract-like.

* * *Flower sweet-scented, with tube 4′–10′ long, bearing scattered and small scaly sepals or bracts, which are considerably longer than the numerous spreading white or cream-colored petals.*

P. crenàtus. Leaf-like branches 1°–2° long, 2′–3′ broad, sinuately notched; flower open in the daytime and for several days, 7′–8′ in diameter, with the stout tube 4′–5′ long, the outer petals or inner sepals brownish.

P. Phyllánthus. Branches nearly as in the preceding; but the flower opening at evening and lasting only till morning, its slender tube many times longer than the small petals.

4. CÈREUS. (Latin name of a *wax-taper* or *candle*, from the form of the stem of some columnar species.) The following are the commonest in cultivation, mostly from Mexico and South America: fl. summer.

§ 1. *Stems and branches long, spreading, creeping or climbing, remotely jointed more or less, only 3–7-angled: very large-flowered.*

* *Flower red, open in daytime for several days: stamens much declined.*

C. speciosíssimus. The commonest red-flowered Cactus; with stems 2°–3° high, rarely rooting, 3 or 4 broad and thin wavy-margined angles or wings, and crimson or red flowers of various shades, 4′–5′ in diameter, the tube shorter than the petals. — There are various hybrids of this with others.

* * *Flower white as to petals, opening at night, collapsing next morning, fragrant, 6′–9′ in diameter when expanded, the tube 4′–5′ long: stems rooting and so climbing: prickles short and fine.* NIGHT-BLOOMING CEREUS.

C. triangulàris has sharply triangular stems, minute prickles, and flower with glabrous tube, olive-green sepals, and yellow stamens.

C. nycticàllus, has 4–6-angled stems with very minute prickles, and flower much like the next but with brownish sepals.

C. grandiflòrus, COMMON NIGHT-BLOOMING CEREUS, has terete stems with 5–7 slight grooves and blunt angles, bearing more conspicuous prickles, long bristles on the flower-tube, and dull yellow sepals.

§ 2. *Stems and branches long, weak, disposed to trail or creep, remotely jointed, cylindrical, with 8 – 12 ribs or grooves and rows of approximated short and fine prickle-clusters: flowers smaller.*

C. serpentinus. Stems 1' or more in diameter, tapering at the apex, about 12-ribbed, disposed to stand when short, not rooting; flower opening for a night, fragrant, with linear petals reddish-purple outside, nearly white inside, 2' long, rather shorter than the tube.

C. flagellifórmis. Stems long and slender, prostrate or hanging and rooting; flower 2' – 3' long, the narrow sepals and petals not very many, rose-red, open by day.

§ 3. *Stems erect, self-supporting, tall-growing, cylindrical and column-like, with about 8 (6 – 10) obtuse ribs and grooves, short mostly dark-colored prickles 9 – 12 in the cluster, and no long bristles: flower large, white; tube 3' – 6' long.*

* *Flower opening at midday, collapsing before night.*

C. Peruviànus. The largest species (except the Giant Cereus of Arizona), becoming even 40° high and thick in proportion, with rather strong compressed ribs and stout prickles; the flower 6' long, with greenish sepals and white or externally rose-tinged petals proportionally short. — Var. MONSTRUÓSUS, in old conservatories, has a short stem with 4 – 8 irregular and wavy wing-like angles, sometimes broken up into tubercles.

* * *Flower opening at night, collapsing next day: tall stem narrower at the top.*

C. erióphorus. Stem jointed at intervals, with rounded ridges and needle-like prickles; flower 6' – 9' long, with woolly tube, and narrow greenish sepals, the upper 4' long, longer than the petals.

C. repàndus. Stem with flatter ridges, and with flowers much as in the foregoing, but the tube not woolly.

C. cærulèscens. Stem bluish-green, becoming about 3' thick, with rounded ridges and stoutish prickles; flower 8' in diameter, with eroded-toothed petals and olive and brown-purple sepals, the longer of these little shorter than the smooth tube.

§ 4. *Stem erect and simple, at length cylindrical, with 20 – 25 narrow ridges, bearing clusters of short prickles and long bristly hairs.*

C. senilis, OLD-MAN CACTUS. Cult. for its singular appearance, the long white hanging bristles at the top likened to the locks of an aged man; flowers (seldom seen) not large, with a very short tube.

§ 5. *Stems short and dwarf, globular or oblong, clustered or branching from the base: flower with very short bell-shaped tube.*

C. cæspitòsus. Wild on the plains from Nebraska S.: 3' – 6' high, becoming short-cylindrical, with 12 – 18 thick ribs, covered with the close clusters each of 20 – 30 short and widely-spreading prickles; flower rose-purple, in daytime, 2' – 3' in diameter.

§ 6. ECHINÓPSIS. *Stem globular or obovate, very proliferous, resembling* Echinocactus, *but flowering from the side; the showy flowers usually open while they last both day and night, and with a long funnel-shaped tube, 6' – 8' long, to which an outer set of stamens is united up to the throat, while the inner ones are separate far down: petals and sepals pointed.*

* *Flower white, fragrant: calyx-tube with tufts of long brownish wool at each scale: globular stem depressed or sunken at top, about 3' in diameter.*

C. Eyrièsii. Stem with about 13 acute slightly wavy ridges, and many small bristly prickles from woolly tubercles.

C. tubiflòrus, or ZUCCARINIÀNUS. Stem broader than high, sunken at top, with 11 very strong and prominent wavy ridges, the woolly tubercles bearing 6 – 8 stout and dark spines.

* * *Flower delicate rose color: calyx-tube with scattered hairs and the scales ciliate: stem somewhat pear-shaped or obovate, 6' – 12' high.*

C. oxỳgonus. Stem bluish, with about 14 acute ridges from a broad base, and as many very short and unequal spines in the clusters.

C. múltiplex. Stem green, with about 13 acute ridges and 10 – 12 rather *long unequal spines.*

5. ECHINOCÁCTUS. (Name means *Spiny* or *Hedgehog Cactus.*) There are many wild species far S. W., but few common in cultivation. Flowers mostly small, opening for 2 or 3 days, closing at night.

E. Texénsis, of S. Texas and Arizona, has stem much broader than high, *or globular when young, becoming 1° broad, with 12 – 27 acute wavy ridges,* 6 or 7 very stout and horn-like reddish recurved spines; the central one larger and turned down, sometimes 2′ long; flower, rose-colored, very woolly, 2′ long.

E. Ottònis, *from Brazil, is pear-shaped, becoming club-shaped,* 2′ – 3′ thick, with 12 – 14 narrow ridges, clusters of 10 – 14 short slender prickles, and yellow flowers with red stigmas.

6. MELOCÁCTUS, i. e. MELON-CACTUS. One species is often brought from the West Indies, but does not long survive, viz.

M. commùnis, called TURK'S-CAP. *Globular or ovate, dark green, often* 1° high, with 12 – 20 ridges, beset with clusters of short brownish spines; the cylindrical muff-like crown of bristles and cottony wool, 2′ – 5′ high, in which *the very small pink flowers are half-imbedded; berries small, red.*

7. MAMILLÀRIA. (Name from the nipple-shaped tubercles which cover the stem.) Many wild species far W. and S. W. on the plains: few common in cultivation.

M. longimámma, from Mexico, has the tubercles rising from a depressed body, *or apparently almost from the root, 1′ or more long,* loosely spreading, much longer than the 8 – 11 prickles at their apex; flowers large for the genus, 1½′ long, yellow.

M. pusílla, *wild in Texas and S., with clustered ovate or globular stems* 1′ – 2′ long, oblong or ovate tubercles bearing wool in their axils, and tipped with very many capillary crisped bristles and several slender prickles; flowers *pink, ½′ long.*

M. grácilis, with globular and at length short-cylindrical stems 1′ – 2′ long, excessively proliferous, the oblong tubercles bearing about 16 recurving white prickles, and on older plants 1 or 2 stouter and longer straight ones of a brown hue; flowers small, white.

M. elongàta, with cylindrical clustered stems, covered with short conical tubercles, which bear 16 – 30 uniform radiating and recurving slender prickles in a starry tuft, and very rarely a central one; flowers small, white.

M. vivípara, wild from Nebraska S., 1′ – 5′ high, simple, or proliferous in tufts, globular, with the terete tubercles slightly grooved down the upper side, bearing 12 – 30 rigid widely radiating whitish prickles, and 3 – 12 *stouter and darker ones; flower pink-purple, large for the plant, about 2′ in* diameter.

50. MESEMBRYANTHEMEÆ, FIG-MARIGOLD FAMILY.

Fleshy plants, of aspect between the Cactus, Purslane, and Orpine Families, with simple entire leaves, and calyx-tube coherent with the compound ovary, which has 4 – 20 styles and as many cells: represented in cultivation by the following.

1. MESEMBRYANTHEMUM. Herbaceous or fleshy-shrubby and prostrate or low branching plants, with very succulent leaves and mostly handsome flowers, opening only in bright light, commonly at noon. Lobes of the calyx mostly 5. Petals (linear) and stamens very numerous, on the calyx. Styles, cells of the *ovary, and radiating horns or lobes of the many-seeded pod 4 – 20.*
2. TETRAGONIA. Low spreading herbs, with broad and flat thickish leaves, and small flowers in their axils. Calyx usually 4-lobed. Petals none. Stamens few or many. Styles and 1-ovuled cells of the ovary few. Fruit hard and nut-like, 2 – 8-horned, 2 – 8-seeded.

1. MESEMBRYÁNTHEMUM, FIG-MARIGOLD. (Name composed of Greek words signifying *flowering at midday.*) Cult. for ornament, chiefly from S. Africa: fl. summer.

* *Annual or biennial, broad-leaved, prostrate, cultivated in open ground.*

M. crystállinum, ICE-PLANT. Plant remarkable for the glittering little excrescences which cover the herbage, like hoar-frost; leaves soft and tender, large, the lower rounded heart-shaped or ovate, upper spatulate, wavy; flowers sessile, white or purplish, ½′ across.

* * *Perennial, somewhat woody-stemmed house-plants, from Cape of Good Hope: leaves all opposite, sessile or connate at base, smooth.*

M. dolabrifórme, HATCHET-LEAVED F. With glaucous and dotted hatchet-shaped leaves, and yellow flowers opening at evening.

M. acinacifórme, SCYMITAR-LEAVED F. With pale 3-sided sabre-shaped leaves (3′ long, fully ½′ wide), flattened branches and peduncle, and pink-purple flower 3′ – 4′ across.

M. spectábile. With glaucous and linear 3-sided pointed leaves, and pink-purple flower 2′ across.

2. TETRAGÒNIA. (Name Greek for *four-angled*, from shape of the fruit.)

T. expánsa, NEW ZEALAND SPINACH. Occasionally cult. as a Spinach: leaves pale, triangular or rhombic-ovate, with short margined petioles; greenish small flower sessile in the axils; stamens several, in clusters alternate with the 4 lobes of the calyx. ①

51. PASSIFLORACEÆ, PASSION-FLOWER FAMILY.

Represented mainly by the Passion-flowers described below. In conservatories may be found one or two species of TACSÒNIA, differing from true Passion-flowers in having a long tube to the flower, but they are uncommon, and rarely blossom.

1. PASSIFLÒRA, PASSION-FLOWER. (Flower of the Passion; the early Roman Catholic missionaries in South America finding in them symbols of the crucifixion, the crown of thorns in the fringes of the flower, nails in the styles with their capitate stigmas, hammers to drive them in the stamens, cords in the tendrils.) Herbs or woody plants with alternate leaves and conspicuous stipules, climbing by simple axillary tendrils; the flowers also axillary, usually with 3 bracts underneath, and a joint in the peduncle. Calyx with a very short tube or cup, and 5 divisions which are colored inside like the petals, and often with a claw-like tip. Petals 5 on the throat of the calyx, or sometimes none: within them the conspicuous crown of numerous filaments or rays, forming a double or more compound fringe. Stamens 5, with narrow-oblong versatile anthers: their filaments united in a tube below sheathing and adhering more or less to the long stalk which supports the 1-celled ovary. Styles 3, mostly club-shaped: stigmas capitate. Fruit berry-like, edible in several species, with many seeds, enveloped in pulp, on 3 parietal placentæ. Fl. summer, open for only one day.

* *Wild species of the country, herbaceous, smooth, with 3-lobed leaves.*

P. lùtea. Low grounds, from S. Penn. to Ill. & S.: slender, low-climbing, with the short and blunt lobes of the leaves entire, and a greenish-yellow flower of no beauty, barely 1′ wide. ♃

P. incarnàta, the fruit, called MAYPOPS in S. States, edible, as large as a hen's egg: trailing or low-climbing, with deeply 3-cleft serrate leaves, a pair of glands on the petiole and one or more on the small bracts, the purple crown of the handsome flower (2′ – 3′ across) rather longer than the pale petals. Dry ground, from Virginia and Kentucky S. ♃

* * *Cult. from South America. Stems woody, except the first.* (These are the commoner species: there are a few hybrids and rarer ones.)

C. verrucòsa, WARTY, LONG-NECK, and CROOK-NECK SQUASH, VEGETABLE MARROW, &c. *Fruit mostly hard-fleshed at maturity, the surface warty, ribbed, or sometimes smooth and even,* from 2° to a few inches in length in the very various forms, in a remarkable one 3°–4° long and little thicker than a man's arm.

§ 2. *Stalks and bright green 5–7-lobed leaves pubescent with soft hairs: fruit-stalk 5-ridged, prominently enlarged where it joins the fruit, the central pulp hardly thready.*

C. moschàta, MUSKY, CHINA, or BARBARY SQUASH, &c. Cult. for the edible fruit, which perfects only S., and is club-shaped, pear-shaped, or long-cylindrical, with a glaucous-whitish surface.

§ 3. *Stalks and almost kidney-shaped slightly or obtusely 5-lobed leaves roughish-hairy: flower-stalks terete: that of the fruit thick, many-striate but not ridged and grooved: inner pulp copious and not thready.*

C. máxima, GREAT or WINTER SQUASH, &c. Fruit rounded, depressed, often much wider than high, or (as in OHIO S.) ovate and pointed, usually banded lengthwise, varying from 6′ to 3° in length or breadth, the hard flesh commonly yellow or orange. The crowned or TURBAN SQUASHES have the top of the fruit projecting beyond an encircling line or constriction which marks the margin of the adherent calyx-tube.

3. CITRÚLLUS, WATERMELON. (Name made from *Citrus*, Latin for Orange or Citron.) ①

C. vulgàris, WATERMELON. Cult. from Asia. Prostrate, with leaves *deeply 3–5-lobed, and the divisions again lobed or sinuate-pinnatifid, pale or bluish;* the refreshing edible pulp of the fruit, in which the dark seeds are imbedded, consists of the enlarged and juicy placentæ, which are reddish or rarely white. — The so-called CITRON of our gardens is a variety with a firm or hard flesh, used for preserving.

4. CÙCUMIS, MELON and CUCUMBER. (The Latin name.) ①

C. Mèlo, MELON, MUSKMELON. Leaves round-heart-shaped or kidney-shaped, the lobes if any and sinuses rounded; fruit with a smooth rind and sweet flesh, the edible part being the inner portion of the pericarp, the thin and watery placentæ being discarded with the seeds. The SERPENT MELON, sometimes called SERPENT-CUCUMBER, is a strange variety, occasionally met with, with a long and snake-like fruit.

C. sativus, CUCUMBER. Leaves more or less lobed, the lobes acute, the middle one more prominent, often pointed; fruit rough or muricate when young, smooth when mature, eaten unripe.

5. MELÒTHRIA. (An ancient Greek name for some sort of grape.) ♃

M. péndula, from Virginia S., is a delicate low climber, with roundish or heart-shaped and 5-angled or lobed roughish leaves, minute flowers, in summer, and oval green berries.

6. ECHINOCÝSTIS, WILD BALSAM-APPLE. (Name from Greek for *hedgehog* and *bladder*.)

E. lobàta. Low grounds, chiefly N. & W., and cult. for arbors: tall-climbing, smoothish, with strongly and sharply 5-lobed leaves, copious and rather pretty white flowers, produced all summer, and oval fruit 2′ long, dry and bladdery after opening; seeds flat. ①

7. SÌCYOS, STAR-CUCUMBER. (Ancient Greek name of Cucumber.)

S. angulàtus. A weed in damp or shady grounds, commoner S., climbing high, clammy-hairy, with roundish heart-shaped and 5-angled or slightly lobed leaves, inconspicuous flowers, and little bur-like fruits beset with deciduous barbed prickles. The tendrils are very active in their movements, and in a warm day coil by a visible motion after contact with a solid body. ①

53. BEGONIACEÆ, BEGONIA FAMILY.

Somewhat succulent herbaceous or more or less woody-stemmed house-plants, of peculiar aspect, with alternate and *unequal-sided* leaves, deciduous stipules, and monœcious flowers, in cymes or clusters on axillary peduncles, numerous stamens, inferior triangular ovary, becoming a many-seeded pod, — represented in choice cultivation by the genus

1. **BEGÒNIA,** ELEPHANT'S-EAR. (Named for *M. Begon*, Governor of St. Domingo 200 years ago.) Flowers with the calyx and corolla colored alike, sometimes dull but usually handsome, both kinds commonly in the same cyme, and flat in the bud; the outer pieces answering to sepals mostly 2, valvate in the bud; the inner, or true petals, 2, or in the fertile flowers usually 3 or 4, or not rarely wanting; in the sterile flowers surrounding a cluster of numerous stamens with short filaments; in the fertile are 3 styles with thick or lobed stigmas. Ovary and pod triangular, often 3-winged. — These curious plants are remarkable for the readiness with which they may be propagated by leaves used as cuttings. The following are the commonest pure species. There are several rarer ones and many hybrids.

* *Leaves and whole plant smooth and naked: rather tall-growing, leafy-stemmed.*

+ *Leaves ovate-oblong, serrate with bristle-tipped teeth, not at all heart-shaped.*

B. fuchsioides, so-called because the bright scarlet flowers, hanging on a slender drooping stalk, may be likened to those of Fuchsia; the crowded and small green and glossy leaves only a little unequal-sided at base.

+ + *Leaves very obliquely heart-shaped or half heart-shaped at base, almost entire.*

B. nítida, with obliquely heart-shaped glossy leaves green both sides, and with large light rose-colored flowers.

B. sanguínea, with large and fleshy obliquely ovate-heart-shaped leaves, having a narrow revolute margin, pale green above, red beneath, as are the stalks; the flowers white, not showy.

B. maculàta, cult. under the name of B. ARGYROSTÍGMA, both names referring to the silvery-white spots scattered over the upper face of the leaves, which are narrower and more oblong than in the preceding, purplish or crimson beneath, the margin cartilaginous but not revolute, the flowers white or flesh-colored.

B. coccínea, with scarlet flowers, as the name denotes, and oblong half heart-shaped leaves glossy above, and green both sides or purple at the margin, which is a little wavy-toothed.

* * *Leaves slightly bristly-hairy above and more so on the sharp teeth: stems elongated, naked, bearing tubers or bulblets in the axils.*

B. Evansiàna (or B. DÍSCOLOR), an old-fashioned species from China, now rare, almost hardy even N., producing all summer showy rose-colored flowers in the open ground; the ovate and heart-shaped pointed leaves not very oblique, red beneath.

* * * *Leaves smooth and naked above, bristle-bearing on the toothed or cut margins and long petioles: stems fleshy, erect or ascending; flowers with the 2 colored sepals, but seldom any petals.*

B. manicàta, a handsome species of the conservatory, remarkable for the purple bristle-bearing scales or fringes on the apex or upper part of the petiole, and similar smaller tufts on the ribs of the lower face of the large and broadly ovate-heart-shaped leaves; flowers small, but numerous and elegant, in an open panicle on a very long naked peduncle, flesh-colored.

B. phyllomaniaca, has the stem thickly beset with leaf-like scales or little adventitious leaves, from which the plant may be propagated, both leafstalks and peduncles bristly, the large leaves ovate-heart-shaped and tapering to a narrow point, their margins cut-toothed, and rather large but not showy flowers.

* * * * *Leaves, or especially the petioles, and the peduncles or scapes, bristly-hairy, these all from a fleshy tuberous or creeping rootstock.*

+ *Leaves large, obliquely heart-shaped, toothed or merely wavy-margined, variously silvered or variegated above, reddish or purple beneath: flowers rather large but not showy: cultivated for their foliage, now much crossed and mixed.*

B. Rex, the most prized and now the commonest species of the group, with the leaf silver-banded or silvery all over the upper face, and smooth pale rose-colored flowers.

B. Griffithii, like the preceding, but leaves and stalks more downy-hairy, and the almost white flowers hairy outside.

B. xanthina, with leaves, &c. much as in the two preceding, but the flowers yellow.

+ + *Leaves deeply about 7-cleft: flowers with only the 2 sepals, no petals.*

B. heracleifòlia, with rather large and rounded hardly oblique leaves, smooth above and sometimes variegated, the lobes broad lanceolate and cut-toothed, and small pale rose or whitish flowers.

54. UMBELLIFERÆ, PARSLEY FAMILY.

Herbs, some innocent and many of them aromatic, others acrid-narcotic poisons, with small flowers in umbels, calyx adherent to the 2-celled ovary which has a single ovule hanging from the summit of each cell, 5 minute calyx-teeth or none, 5 petals, 5 stamens, and 2 styles; the dry fruit usually splitting into 2 seed-like portions or akenes: seed with hard albumen and a minute embryo. Eryngium and one or two others have the flowers in heads instead of umbels. Stems usually hollow. Leaves alternate, more commonly compound or decompound. Umbels mostly compound: the circle of bracts often present at the base of the general umbel is called the *involucre;* that at the base of an umbellet, the *involucel.*

The flowers being much alike in all, the characters have to be taken from the form of the fruit, and much stress is laid upon the receptacles of aromatic oil (*vittæ* or oil-tubes) which are found in most species and give characteristic flavor. The family is too difficult for the beginner. So that only the common cultivated, and the most conspicuous or noteworthy wild species are given here. For the remainder the student is referred to the Manual, and to Chapman's Southern Flora.

§ 1. *Fruits covered with little scales or tubercles, crowded (as are the flowers) in a head instead of an umbel, and with a pointed scaly bract under each flower.*

1. ERYNGIUM. Flowers blue or white, with evident awl-shaped calyx-teeth, and top-shaped fruit without any ribs. Leaves in our species simple and with bristly or prickly teeth.

§ 2. *Fruits covered with bristly prickles, bur-like: umbels compound.*

2. SANICULA. Flowers greenish or yellowish, so short-stalked or nearly sessile that the umbellets appear like little heads, each with some perfect and fertile and some staminate flowers. Fruits ovoid or globular, not readily splitting in two, not ribbed, completely covered with short hooked prickles. Leaves palmately parted.

3. DAUCUS. Flowers white or cream-color, in a regular compound umbel: the petals unequal, or those of the marginal flowers larger. Prickles in rows on the ribs of the short fruit, which splits in two when ripe. Leaves pinnately compound or decompound.

§ 3. *Fruits naked (not prickly), splitting when ripe and dry into two one-seeded pieces or carpels, each usually with 5 ribs or some of them may be wings.*

* *Umbels simple or sometimes proliferous, one over the other. Leaves simple.*

4. HYDROCOTYLE. Flowers white. Fruit much flattened contrary to the line of junction of the two carpels: no oil-tubes. Leaves rounded.

* * *Umbels compound. Fruits mostly with oil-tubes in the form of lines or stripes, one or more in the intervals between the ribs, and some on the inner face, sometimes also under the ribs.*

+ *Fruit wingless.*

++ *Seed concave on the inner face: marginal flowers larger and irregular.*

5. CORIANDRUM. Fruit globular, not readily splitting in two, indistinctly many-ribbed: a pair of large oil-tubes on the inner face of each carpel. Flowers white. Leaves pinnately compound. Plant strong-scented.

++ ++ *Seed deeply grooved down the inner face: flowers all alike, white.*

6. OSMORRHIZA. Fruit long and slender, club-shaped, or tapering at the base, somewhat sweet-aromatic: no obvious oil-tubes. Leaves twice or thrice ternate. Root sweet-aromatic.
7. CONIUM. Fruit short, broadly ovate, rather strong-scented, compressed at the sides, each carpel with 5 strong and more or less wavy ribs: oil-tubes many and minute. Leaves pinnately decompound.

++ ++ ++ *Seed slightly if at all hollowed out on the inner face.*

8. CICUTA. Fruit globular and contracted on the sides, each carpel with 5 broad and thickened blunt ribs, and an oil-tube in each interval: the slender axis between the carpels splitting in two. Flowers white. Leaves pinnately decompound, not aromatic. Fruit aromatic.
9. SIUM. Fruit globular or short-oblong and contracted on the sides, each carpel with 5 strong or corky ribs, and commonly 2 or more oil-tubes in the narrow intervals. No axis or hardly any left when the carpels separate. Flowers white. Leaves pinnate. Not aromatic.
10. APIUM. Fruit ovate or broader than long, flattened on the sides, each carpel 5-ribbed and a single oil-tube in the intervals: axis left when the carpels separate not splitting in two. Flowers white.
11. CARUM. Fruit ovate or oblong, flattish on the sides; each carpel with 5 narrow ribs, and a single oil-tube in the intervals: the axis from which the carpels separate splitting in two. Flowers mostly white. Leaves decompound. Fruit or foliage aromatic.
12. FŒNICULUM. Fruit oblong; the two carpels with a broad flat face, 5 stout ribs, and a single oil-tube in the intervals between the ribs. Flowers yellow. Leaves decompound: the leaflets slender thread-shaped. Whole plant sweet-aromatic.

+ + *Fruit winged or wing-margined at the junction of the two carpels, which are flat on the face and flat or flattish and 3-ribbed on the back. Leaves pinnately or ternately compound.*

++ *Wing double at the margins of the fruit.*

13. LEVISTICUM. Fruit ovate-oblong, with a pair of thickish marginal wings, and single oil-tube in each interval. Involucre and involucels conspicuous, the bracts of the latter united by their margins. Flowers white. Plant sweet-aromatic.
14. ARCHANGELICA. Fruit ovate or short-oblong, with thin or thickish marginal wings, and many small oil-tubes adherent to the surface of the seed. Involucels of separate mostly small bracts: involucre hardly any. Flowers white or greenish.

++ ++ *Wing surrounding the margin of the fruit single, splitting in two only when the ripe carpels separate.*

15. HERACLEUM. Fruit, including the thin and broad wing, orbicular, very flat, and the three ribs on the back very slender: the single oil-tubes in the intervals reaching from the summit only half-way down. Flowers white, the marginal ones larger and irregular. Leaves ternately compound. Plant strong-scented.
16. PASTINACA. Fruit oval, very flat, thin-winged: the single oil-tubes running from top to bottom. Flowers yellow, the marginal ones not larger. Leaves pinnately compound.

1. ERÝNGIUM, ERYNGO. (Ancient name, of obscure meaning). Fl. in summer.

E. yuccæfòlium, BUTTON-SNAKEROOT. Sandy and mostly damp ground, from New Jersey S. & W.: stout herb, 2° – 3° high, smooth, of aspect quite unlike most Umbelliferous plants, having linear and tapering grass-like leaves, parallel-veined in the manner of an Endogen, and fringed with bristles, a few globular thick heads in place of umbels, a very short involucre, and white flowers. ♃

E. Virginiànum. Wet grounds from New Jersey S.: with lance-linear rather veiny leaves showing some distinction between blade and petiole, the former with rigid teeth, and involucre longer than the bluish heads. ② There are several other species from North Carolina S.

2. SANÍCULA, SANICLE. (Latin name, from *sano*, to heal.) Common in thickets and open woods. Flowers greenish, crowded in small and head-like umbellets, in summer. ♃

S. Canadénsis. Stems 1° – 2° high; leaves thin, palmately 3 – 5-parted into wedge-obovate or oblong sharply cut and toothed divisions, the side ones often 2-lobed; umbellets rather few-flowered, with the sterile flowers in the centre almost sessile; stýles shorter than prickles of the bur-like fruit.

S. Marilándica. Stems 2° – 3° high; leaves of firmer texture, with narrower divisions and rigid teeth; umbellets with many flowers, the sterile ones on slender pedicels, fertile ones with long styles.

3. DAÙCUS, CARROT. (Ancient Greek name.) Fl. in summer.

D. Caròta, COMMON C. Cult. from Europe for the root, occasionally run wild: leaves cut into fine divisions; umbel concave and dense in fruit, like a bird's nest; involucre of pinnatifid leaves. ②

4. HYDROCÓTYLE, WATER-PENNYWORT. (From Greek words for *water* and *flat dish*.) Low and small very smooth herbs, growing in water or wet places, mostly with creeping or rooting stems, and simple rounded leaves either kidney-shaped or peltate. Fl. all summer. ♃

* *Leaves peltate from the centre, on long petioles which, as well as the peduncles, rise from slender running rootstocks: fruit sharp-margined.*

H. umbellàta. Along the coast and rivers from Mass. S.: flowers many in the umbel, on slender pedicels; petioles and peduncles 3′ – 8′ high.

H. interrúpta. Same range, smaller than the other, with few flowers on short pedicels in each of the little umbellets growing one above the other to form an interrupted spike.

* * *Leaves not peltate: peduncles and pedicels both short: stems slender, branched.*

H. Americàna. Shady damp places; leaves thin, small, crenate and lobed, on short petioles, with minute flowers in their axils.

There are two larger, long-petioled, but less common species from Pennsylvania S., viz. H. REPÁNDA and H. RANUNCULOÌDES.

5. CORIÁNDRUM, CORIANDER. (Name from Greek word for bug: the herbage has a bedbug-like scent.)

C. satìvum. Cult. from the Orient, for the aromatic *coriander-seed*; low, with small umbels of few rays; fl. summer. ①

6. OSMORRHÌZA, SWEET CICELY, not the European plant of that name, which is MÝRRHIS ODORÀTA, with much more sweet-scented fruit. (Name, Greek for *scented root*, the root being sweet-aromatic.) Rich moist woods, common N.: fl. late spring and summer. ♃

O. longístylis, the smoother species, with the sweeter root, has slender stylés, and ovate cut-toothed short-pointed leaflets, which are slightly downy.

O. brevístylis, has conical styles not longer than the breadth of the ovary, and downy-hairy taper-pointed almost pinnatifid leaflets.

7. CONÌUM, POISON HEMLOCK. (Greek name of the Hemlock by which criminals and philosophers were put to death at Athens.)

C. maculàtum, SPOTTED H. Waste grounds, run wild, from Eu.: a smooth, branching herb, with spotted stems about 3° high, very compound leaves with lanceolate and pinnatifid leaflets, ill-scented when bruised: a *virulent poison*, used in medicine: fl. summer. ②

8. CICÙTA, WATER-HEMLOCK. (Ancient Latin name of the true Hemlock, transferred to some equally *poisonous* plants.) Fl. summer. ♃

C. maculàta, SPOTTED COWBANE, MUSQUASH-ROOT, BEAVER-POISON, &c. Tall smooth stem sometimes streaked with purple, but seldom really spotted; leaflets lance-oblong, coarsely toothed or sometimes cut-lobed, veiny, the main veins mostly running into the notches; fruit aromatic when bruised; root a *deadly poison*.

9. SÌUM, WATER-PARSNIP. (Old name, of obscure meaning.) ♃

S. lineàre, the common species, in water and wet places: tall, smooth, with grooved-angled stems, simply pinnate leaves, the long leaflets linear or lanceolate, very sharply serrate and taper-pointed, and globular fruit with wing-like corky ribs: fl. all summer. Root and herbage also *poisonous*.

10. ÀPIUM, CELERY, &c. (Old Latin name.) One species cult.: viz.

A. gravèolens. A strong-scented, acrid, if not poisonous plant, of the coast of Europe; of which the var. DÙLCE, GARDEN CELERY, is a state rendered *bland and the base of the leafstalks enlarged, succulent and edible when* blanched, through long cultivation; leaves pinnately divided into 3 – 7 coarse and wedge-shaped cut or lobed leaflets or divisions; umbels and fruits small. Var. RAPÀCEUM, TURNIP-ROOTED CELERY, is a state with the root enlarged and eatable. ②

11. CÀRUM, CARAWAY, &c. (Name perhaps from the country, *Caria*.)

§ 1. TRUE CARAWAY, *with finely pinnately compound leaves, and white flowers.*

C. Càrui, GARDEN CARAWAY: cult. from Eu., for the *caraway-seed*, the oblong highly aromatic fruit; stem-leaves with slender but short thread-shaped divisions.

§ 2. PARSLEY OR PETROSELÌNUM, *with coarser leaves and greenish flowers.*

C. Petroselìnum (*or* PETROSELINUM SATÌVUM), PARSLEY: cult. from Eu., especially the curled-leaved state, for the pleasant-flavored foliage, used in cookery, chiefly the root-leaves, which have ovate and wedge-shaped 3-lobed and cut-toothed divisions; fruit ovate. ②

12. FŒNÍCULUM, FENNEL. (Name from the Latin *fœnum*, hay.)

F. vulgàre, COMMON F. Cult. from Eu., for the sweet-aromatic foliage and fruit: stout very smooth herb 4° – 6° high; leaves with very numerous and slender thread-shaped divisions; large umbel with no involucre or involucels; *fruit ¼′ or ⅓′ long, in late summer.* ♃

13. LEVÍSTICUM, LOVAGE. (Ancient Latin name.) One species.

L. officinàle, GARDEN L. Cult. in old gardens, from Eu.: a tall, very smooth, sweet aromatic herb, with large ternately or pinnately decompound leaves, coarse wedge-oblong and cut or lobed leaflets, a thick root, and small many-flowered umbels. ♃

14. ARCHANGÈLICA. (Genus established on a species of Angelica.) Fl. summer. ♃

A. atropurpùrea, GREAT A. Moist deep soil N.: strong-scented, smooth, with very stout dark-purple stem 3° – 6° high, large leaves ternately compound, and the divisions with 5 – 7 pinnate leaflets, which are ovate and

cut-serrate; petioles with large inflated membranaceous base; flowers greenish-white; fruit smooth and thin-winged.

A. hirsùta. Dry ground, commoner S.: stem 2° – 5° high, rather slender, downy at top, as are the umbels and broadly winged fruits; leaflets thickish, ovate-oblong, serrate; flowers bright white.

15. HERACLÈUM, COW-PARSNIP. (Named after *Hercules*.) Fl. summer. ♃

H. lanàtum, DOWNY C., wrongly called MASTERWORT. Damp rich ground N.: very stout, 4° – 8° high, wooly-hairy when young, unpleasantly strong-scented, with large cut and toothed or lobed leaflets, some of them heart-shaped at base, and broad umbels with white flowers and large fruits.

16. PASTINÀCA, PARSNIP. (Latin name, from *pastus*, food.)

P. sativa, COMMON P. Run wild in low meadows, and then rather *poisonous*, cult. from Eu. for the esculent strong-scented root: tall, smooth, with grooved stem, coarse and cut-toothed or lobed leaflets, and umbels of small yellow flowers. ②

55. ARALIACEÆ, GINSENG FAMILY.

Like the foregoing family, but often shrubs or trees, usually more than two styles and cells to the ovary and fruit, the latter a berry or drupe. Besides a few choice and uncommon shrubby house-plants, represented only by the two following genera. The flowers in both are more or less polygamous, and the lobes or margin of the calyx very short or none. Petals and stamens 5.

1. ARALIA. Flowers in simple or panicled umbels, white or greenish: the petals lightly overlapping in the bud. Styles 2 – 5, separate to the base, except in sterile flowers. Leaves compound or decompound. Root, bark, fruit, &c. warm-aromatic or pungent.
2. HEDERA. Flowers in panicled or clustered umbels, greenish: petals valvate in the bud. Ovary 5-celled: the 5 styles united into a conical column. Leaves simple, palmately 3 – 5-lobed or angled. Woody stems climbing by rootlets.

1. ARÀLIA. (Derivation obscure: said to be a Canadian name under which a species was sent from Quebec to the Garden of Plants at Paris.) ♃

§ 1. WILD SARSAPARILLA, &c. *Flowers perfect or polygamous with both fertile and sterile on the same plant: umbels more than one: fruit black or dark purple, spicy: seeds or cells and styles 5.*

* *Large and leafy-stemmed, with very compound leaves sometimes 2° or 3° across, and with many umbels in a large compound panicle: fl. in summer.*

A. spinòsa, ANGELICA TREE, HERCULES' CLUB. River-banks from Penn. S., and planted: a shrub or low tree, of peculiar aspect, the simple stout trunk rising 6° – 20° high and beset with prickles, bearing immense leaves with ovate serrate leaflets, and corymbed or panicled umbels.

A. racemòsa, SPIKENARD. Woodlands in rich soil, with herbaceous stems 3° – 5° high from a thick aromatic root, not prickly, widely spreading branches, heart-ovate leaflets doubly serrate and slightly downy, and racemed-panicled-umbels.

* * *Smaller: short stems scarcely woody at base: few umbels: fl. early summer.*

A. hìspida, BRISTLY SARSAPARILLA. Rocky places: bristly stems 1° – 2° high, leafy below, naked and bearing corymbed umbels above; leaves twice pinnate, the leaflets oblong-ovate and cut-toothed.

A. nudicaùlis, COMMON WILD S. Low ground: the aromatic horizontal slender roots running 3° – 5° long, used as a substitute for officinal Sarsaparilla; the smooth proper stem rising only 2′ – 4′ inches, bearing a single long-stalked

leaf of 5 ovate or oval serrate leaflets on each of the 3 divisions of the petiole, and a short peduncle with 2 – 7 umbels.

§ 2. GINSENG. *Sterile and fertile flowers on separate simple-stemmed plants, in a single slender-stalked umbel, below it a single whorl of digitate leaves: styles and cells of the fruit 2 or 3.*

A. quinquefòlia, GINSENG. Rich woods N.: root spindle-shaped, warm-aromatic, 4′ – 9′ long; stem 1° high; leaflets 5 at the end of each of the 3 petioles, slender-stalked, thin, obovate-oblong, pointed, serrate; fl. in summer; fruit red.

A. trifòlia, DWARF G. or GROUND-NUT. Low woods, N.: 4′ – 8′ high from a deep globular pungent-tasted root; leaflets 3 or sometimes 5 sessile on the end of each of the 3 petioles, narrow-oblong and obtuse: fl. in spring; fruit orange-yellow.

2. HÉDERA, IVY. (The ancient Latin name.) Fl. late summer.

H. Hèlix, TRUE or ENGLISH IVY, from Europe. Woody climber, with evergreen glossy rounded heart-shaped or kidney-shaped and 3-lobed or 3-angled leaves, or in some varieties more deeply 3 – 7-cleft, yellowish-green flowers, and blackish berries; covers shaded walls, &c., adhering by its rootlets, but scarcely stands far N. without some protection.

56. CORNACEÆ, DOGWOOD FAMILY.

Shrubs, trees, or one or two mere herbs, with simple leaves, small flowers, calyx-tube in the perfect or pistillate ones coherent with the surface of the 1 – 2-celled ovary, which is crowned with the small calyx-teeth or minute cup, bearing the petals (valvate in the bud) and stamens of the same number: style and stigma single: ovule and seed solitary in the cells, hanging from the summit: fruit a small drupe or berry.

GÁRRYA ELLIPTICA, a singular Californian shrub, with thick opposite leaves, and diœcious greenish flowers in hanging catkin-like spikes, is rarely cultivated or planted.

1. CORNUS. Flowers perfect, in cymes, close clusters, or heads (with or without a corolla-like involucre). Minute teeth of the calyx, petals, and stamens 4. Style slender: stigma terminal. Berry-like little drupe with a 2-celled 2-seeded stone. Leaves entire, opposite except in one species, deciduous. Bark very bitter, tonic.
2. AUCUBA. Flowers diœcious, dull purple, in axillary panicles. Teeth or lobes of the calyx and petals 4. Stamens in the sterile flowers 4, with short filaments and oblong anthers. Fertile flowers with a 1 celled ovary, becoming an oblong red berry in fruit: style short: stigma capitate. Leaves opposite, coriaceous and glossy, evergreen, smooth, more or less toothed.
3. NYSSA. Flowers polygamous or diœcious, greenish, crowded or clustered on the summit of an axillary peduncle, the sterile ones numerous, the fertile 2 – 8 in a bracted cluster, or rarely solitary. Calyx of 5 or more lobes or teeth. Petals small and narrow, or minute, or none. Style slender or awl-shaped, bearing a stigma down the whole length of one side, revolute. Ovary and stone of the drupe 1-celled and 1-seeded. Trees, with deciduous alternate leaves, often crowded on the end of the branchlets, either entire, angled, or few-toothed.

1. CÓRNUS, CORNEL or DOGWOOD. (Name from *cornu*, horn, from the hardness of the wood.) Fl. late spring and early summer.

§ 1. *Flowers greenish, crowded in a head or close cluster, which is surrounded by a showy corolla-like (white or rarely pinkish) 4-leaved involucre: fruit bright red.*

C. Canadénsis, DWARF CORNEL, BUNCH-BERRY. Damp woods N.: a low herb, the stems springing from creeping slender subterranean shoots

which are slightly woody, bearing 4 – 6 ovate or oval leaves at the summit, as if in a whorl, below the stalked flower-head; petal-like leaves of the involucre ovate; fruits globular, in a cluster, rather eatable.

C. flórida, Flowering Dogwood. Rocky woods, also planted for ornament: tree 12° – 30° high, with ovate pointed leaves, petal-like leaves of the involucre ($1\frac{1}{2}'$ long) obcordate or obovate and notched, and oval fruits in a head. According to common tradition flowering just at the proper time for planting Indian Corn.

§ 2. *Flowers yellow (earlier than the leaves), in a small umbel, surrounded by a small and dull-colored involucre of 4 scales: fruit bright red.*

C. Mas. Sparingly planted from Eu.: a tall shrub or low tree, with oval pointed leaves and handsome oblong fruit, the pulp eatable and pleasantly acid.

§ 3. *Flowers white in open and flat cymes, without involucre, in early summer: fruit small, globular, not eatable, blue or white, in an exotic species black.*

* *Branches of the previous year red or purple, especially in spring.*

C. sanguínea, European Red-Osier D. Sometimes planted from Eu.: erect, with ovate leaves rather downy beneath, and black or dark purple fruit.

C. stolonífera, Wild Red-Osier D. Shrub 3° – 6° high, in wet places N., spreading by prostrate or subterranean running shoots, smooth, with ovate abruptly pointed leaves roughish both sides and whitish beneath, small cymes, and white or lead-colored fruit.

C. sericea, Silky D. or Kinnikinnik (the dry bark smoked by the Indians W.): in wet places, has dull red branches, the shoots, cymes, and lower face of the narrow ovate or oblong pointed leaves silky-downy; fruit bluish.

* * *Branches brownish or gray.*

C. asperifòlia, Rough-leaved D. Dry soil from Illinois S.: shrub 3° – 5° high, with branches and small oblong or ovate leaves pubescent, upper face of the latter rough, the lower downy; cymes small and flat; fruit bluish.

C. stricta, Stiff D. Wet grounds S.: shrub 8° – 15° high, with ovate or lance-ovate taper-pointed leaves smooth and green both sides, loose flat cymes, and pale blue fruit.

C. paniculàta, Panicled D. Moist grounds, common N.: shrub 3° – 8° high, much branched, smooth, with ash-colored bark, lance-ovate pointed leaves acute at base and whitish beneath, and proportionally large and numerous convex cymes, often panicled; fruit white.

* * * *Branches green streaked with brownish or whitish.*

C. circinàta, Round-leaved D. Wooded hillsides, &c.: shrub 3° – 10° high, with warty-dotted branches, pretty large round-oval and short-pointed leaves downy beneath, small flat cymes, and light blue fruit.

C. alternifòlia, Alternate-leaved D. Hillsides and banks of streams: shrub or tree 8° – 25° high, with streaked alternate and spreading branches, ovate or oblong taper-pointed leaves acute at base and only minutely pubescent beneath, mostly *alternate*, but crowded at the end of the branches; cymes large and flat, very open; fruit bright blue on reddish stalks.

2. AÙCUBA. The Japanese name of the species commonly cultivated as a house-plant, viz.

A. Japónica. Shrub, with large ovate-oblong leaves bright green and usually marbled with yellow, the flowers inconspicuous, but the red berries when formed handsome.

3. NÝSSA, TUPELO, PEPPERIDGE, SOUR GUM-TREE. (The Greek name of a Nymph, of no very obvious application to these trees.) Fl. spring. Fruit acid.

* *Sterile flowers in loose clusters: fruit blue, not eatable.*

N. multiflòra, Common Tupelo or Sour Gum, in rich woods, N. & S.: tree 30° – 50° high, with horizontal branches and Beech-like spray, ovate or obovate leaves entire and smooth or glossy when old, fertile flowers 3 – 8 on the

slender peduncle, and dark blue oval fruit ½′ long. Wood tough, hard to split. Leaves changing to bright crimson in autumn.

N. aquática, WATER TUPELO, of the S., in pine-barren swamps; with smaller leaves than in the preceding (1′ – 2′ long) and varying from lance-oblong to roundish, short peduncles, the fertile 1 – 2-flowered, and smaller oval fruit.

N. uniflòra, LARGE TUPELO; in water, from Virg. and Kentucky S.: large tree, with leaves ovate or oblong, acute, often with a few sharp teeth, 4′ – 6′ long, on slender petioles, downy beneath; fertile peduncles long and 1-flowered; fruit oblong, about 1′ long. Wood soft: roots very spongy, used for corks.

* * *Sterile flowers in a head: oblong fruit red and eatable.*

N. capitàta, OGEECHEE LIME; so called from the acid fruit (1′ or more long): in swamps far S.: a small tree, with oblong or obovate leaves (3′ – 5′ long) downy beneath; fertile flowers solitary on very short peduncles.

II. MONOPETALOUS DIVISION. Includes the orders of this class which have both calyx and corolla, and the latter in one piece, that is, the petals united more or less into one body.

57. CAPRIFOLIACEÆ, HONEYSUCKLE FAMILY.

Shrubs, or rarely herbs, with calyx adherent to the 2 – 5-celled ovary (the teeth or limb above it sometimes nearly obsolete or obscure), stamens as many as the lobes of the corolla (or in Linnæa one fewer) and borne on its tube, and opposite leaves without stipules. Yet in some species of Viburnum there are little appendages imitating stipules on the base of the petiole. Seeds with a small embryo in fleshy albumen.

§ 1. *Perennial herbs, with bell-shaped or tubular corolla, prominent awl-shaped or linear lobes to the calyx, and a slender style tipped with a capitate stigma.*

1. LINNÆA. A pair of flowers nodding on the summit of a slender scape-like peduncle. Corolla narrow bell-shaped, with 5 almost equal rounded lobes. Stamens 4, two of them shorter. Ovary and small pod 3-celled, but perfecting a seed in only one cell. Creeping evergreen herb.

2. TRIOSTEUM. Flowers sessile in the axils of the leaves, single or in a cluster. Corolla oblong-tubular, with 5 short almost equal lobes, scarcely longer than the leaf-like lobes of the calyx. Stamens 5, equal. Fruit fleshy, orange or red, crowned with the persistent calyx-lobes, containing 3 bony seeds or rather nutlets. Erect and coarse leafy herbs; their leaves narrowed at base, but united around the simple stem.

§ 2. *Shrubby, with tubular or bell-shaped corolla, slender style, and capitate stigma.*

* *Teeth of the calyx very short on the 2 – 4-celled ovary: fruit a berry: leaves simple, entire, or rarely wavy or lobed on some vigorous young shoots.*

3. SYMPHORICARPUS. Flowers small, in close clusters or interrupted spikes. Corolla bell-shaped, with 4 or 5 equal roundish lobes and as many short stamens in the throat. Ovary 4-celled, but the berry only 2-seeded, two cells being empty. Low upright shrubs, with oval short-petioled leaves.

4. LONICERA. Corolla tubular, funnel-form, or oblong, more or less irregular, being gibbous or bulging on one side at base, and the 5 lobes not all alike, but in one species nearly so. Stamens 5. Ovary 2 – 3-celled, becoming a several-seeded berry. Twining or upright shrubs.

* * *Teeth or lobes of the calyx slender, on the summit of the slender or taper-pointed ovary, which becomes a many-seeded 2-valved pod: leaves simple, serrate.*

5. DIERVILLA. Corolla funnel-form, almost regular, 5-lobed. Stamens 5. Ovary narrow, sometimes linear and stalk-like. Low upright shrubs, with flowers in terminal or axillary loose clusters or cymes.

§ 3. *Shrubs or some low trees, with small flowers in broad cymes, short and widely open deeply 5-lobed regular corolla, 1 – 3 sessile stigmas, and berry-like fruit, containing 1 – 3 seeds or rather seed-like stones. Calyx-teeth on the ovary very short or obscure: stamens 5.*

6. VIBURNUM. Leaves simple. Fruit containing a single flat or flattish stone.
7. SAMBUCUS. Leaves pinnate, and the oblong or lanceolate leaflets serrate. Fruit containing 3 seeds or rather small seed-like stones.

1. LINNÆA, TWIN-FLOWER. (Named for *Linnæus.*) Only one species,

L. boreàlis. Mossy woods and cold bogs N.: creeping stems bearing round-oval and sparingly crenate somewhat hairy small leaves, and in early summer the sweet-scented flowers; corolla purple and whitish, hairy inside.

2. TRIÓSTEUM, FEVERWORT, HORSE-GENTIAN. (Greek for *three bones*, from the 3 bony seeds or rather stones.) The root has been used in medicine, and the seeds for coffee. In rich soil: fl. early summer.

T. perfoliàtum, the common species, is softly hairy, 2° – 4° high, with oval leaves abruptly narrowed at base, and brownish-purple flowers.

T. angustifòlium, chiefly S., a smaller and bristly-hairy plant, with narrower lanceolate leaves more tapering at base, and greenish or cream-colored flowers.

3. SYMPHORICÁRPUS. (Name from the Greek, denotes *crowded fruits.*) Wild on rocky banks, especially W. & S., and cult. for the ornamental insipid berries. Flowers white or slightly rose-color, produced all summer.

S. racemòsus, SNOWBERRY. Clusters of flowers in interrupted leafy spikes (rather than racemes) terminating the branches; berries snow-white, in autumn. Common in gardens.

S. vulgàris, CORAL-BERRY, INDIAN CURRANT. Short clusters of flowers in the axils of most of the leaves; berries small, dark red.

4. LONICÈRA, HONEYSUCKLE, WOODBINE. (Named for an old German herbalist, *Lonitzer*, latinized *Lonicerus.*)

§ 1. TRUE HONEYSUCKLES, *with twining stems (in one wild species slightly so).*

* *Corolla with very long tube and 5 short almost regular lobes.*

L. sempérvirens, TRUMPET H. Wild from New York S., and commonly cult. Leaves evergreen (as the name denotes) only at the S., thickish, pale beneath, the lower oblong, the uppermost pairs united round the stem; flowers scentless, in spiked whorls, 2′ long, scarlet with yellow inside (also a yellow variety), produced all summer; berries red.

* * *Corolla strongly 2-lipped; lower lip narrow, upper one broad and 4-lobed.*

+ *The 2 to 4 uppermost pairs of leaves united round the stem in the form of an oval or rounded disk or shallow cup, the flowers sessile in their axils, or partly in leafless spiked whorls beyond: berries red or orange.*

++ *European Honeysuckles, cultivated for ornament: flowers purple and white or turning yellowish inside, sweet-scented, in summer.*

L. Caprifòlium, COMMON EUROPEAN H., has leaves smooth on both sides, and flowers usually only in early summer.

L. Etrúsca, ITALIAN OR PERPETUAL H., has the leaves downy beneath and blunter, and flowers through the summer.

++ ++ *Wild species, with flowers smooth and nearly scentless, except the first species, in late spring or early summer: leaves smooth (except one variety) and glaucous or whitish beneath.*

L. gràta, SWEET WILD H. Wild in Middle States and S., sometimes cult.: leaves obovate; corolla white with a pink or purple slender tube, fading yellowish, fragrant.

L. flàva, YELLOW H. Wild N. W. and along the Alleghanies; low-climbing; the broad and thickish leaves very white-glaucous both sides; flowers light yellow.

L. parviflòra, SMALL H. Low and bushy, with oblong leaves green above, but very white-glaucous beneath; the corolla (less than 1′ long) strongly gibbous at base, greenish-yellow or whitish and tinged with purple: in the var. **Douglasii,** found only N. W., nearly crimson, and the greener leaves downy beneath or ciliate.

↔ ↔ ↔ *Wild species with clammy-pubescent orange-colored flowers.*

L. hirsùta, HAIRY H. Moist or rocky grounds N. & W.: with oval and large dull green leaves, the lower face and branches downy-hairy.

↔ ↔ *Leaves all separate and short-petioled, not glaucous, pubescent: flowers in pairs on axillary peduncles.*

L. Japónica (commonly so called, L. CONFÙSA, DC.), JAPAN or CHINESE H. Commonly cult.; the slender downy stems twining freely, with oval dull green leaves, and flowers very fragrant at evening; corolla deeply 2-lipped, reddish outside, white inside turning yellow.

§ 2. FLY-HONEYSUCKLES, *upright or straggling bushes, never twining, with leaves all distinct to the base, and a pair of flowers on the summit of an axillary peduncle, the two berries sometimes united into one.*

* *Four large leafy bracts surrounding two cylindrical (¾′ long) yellowish flowers.*

L. involucràta. Wild from Lake Superior to California, and sparingly planted: shrub 2° – 5° high, downy when young, with ovate or oblong leaves 3′ – 5′ long, on short petioles, clammy flowers, and berries quite separate.

* * *The two or four bracts under the ovaries small or minute.*

↔ *Planted for ornament from Europe: flowers rose or pink-red, profuse and showy.*

L. Tartárica, TARTARIAN H. Much-branched shrub 5° – 8° high, smooth, with oval heart-shaped leaves, short corolla, and red berries uniting at base as they ripen: fl. spring.

↔ ↔ *Wild species, in moist cold woods or bogs N.: flowers yellowish.*

L. ciliàta, EARLY FLY-H. Straggling, 3° – 5° high, with oval or oblong and partly heart-shaped leaves thin and downy beneath when young, slender peduncles, honey-yellow corolla (¾′ long) with short nearly equal lobes and very unequal-sided base, and separate red berries: fl. early spring.

L. oblongifòlia, SWAMP F. Upright, 2° – 5° high, with oblong leaves, long and slender peduncles, deeply 2-lipped corolla (½′ long) in early summer, and purple berries.

L. cærùlea, MOUNTAIN F., the rarest species, 1° – 2° high, with oval leaves, very short peduncle, moderately 5-lobed corolla, and two ovaries united to form one blue berry.

5. DIERVÍLLA, BUSH-HONEYSUCKLE. (Named for one *Dierville,* who took the common species from Canada to France.)

* *Wild species, on rocks and hills, with pale or honey-yellow and slender funnel-form corolla, not showy, and oblong pod.*

D. trífida, COMMON B.; everywhere N., 1° – 4° high, with oblong-ovate taper-pointed leaves on distinct petioles, mostly 3-flowered peduncles, and slender, pointed pods: fl. all summer.

D. sessilifòlia, only along the Alleghanies S., has lance-ovate sessile leaves, many-flowered peduncles, and short-pointed pods: fl. summer.

* * *Planted for ornament from Japan and China; the showy rose-colored corolla broadly funnel-form with an abruptly narrowed base, very slender stalk-like ovary and linear pod.*

D. Japónica. Shrub 2° – 5° high, loaded with the handsome flowers in late spring; corolla 1′ or more long; leaves oblong-ovate, taper-pointed.

6. VIBÚRNUM, ARROW-WOOD, &c. (Ancient Latin name, of uncertain meaning.) Flowers white, or nearly so, in spring or early summer: fruit ripe in autumn.

§ 1. *Flowers all alike, small, and perfect.*

* *Cult. or planted from S. Europe, with evergreen smooth entire leaves.*

V. Tìnus, LAURESTINUS. Not hardy N., but a common house-plant, winter-flowering, or planted out in summer; leaves oblong; fruit dark purple.

* * *Wild species, some occasionally planted: leaves deciduous, at least N.*

+ *Leaves not lobed nor coarsely toothed, smooth or with some minute scurf: fruit black or with a bluish bloom.*

++ *Leaves glossy, finely and evenly serrate with very sharp teeth.*

V. Lentàgo, SHEEP-BERRY. Tree 15° – 30° high, common in moist grounds, chiefly N.; leaves ovate, conspicuously pointed, on long margined petioles; cyme broad, sessile; fruit oval, $\frac{1}{2}'$ or more long, sweet, eatable.

V. prunifòlium, BLACK HAW. Dry soil, from Conn. to Ill. and S.: hardly so tall as the preceding, with smaller and oval mostly blunt leaves.

++ ++ *Leaves entire or with a few wavy or crenate small teeth, thickish.*

V. obovàtum. Along streams from Virginia S.: shrub with obovate leaves seldom over 1′ long, and small sessile cymes.

V. nùdum, WITHE-ROD. Swamps, from New England to Florida; with leaves oval, oblong, or almost lanceolate, not glossy; cyme on a peduncle; fruit roundish.

+ + *Leaves coarsely toothed, strongly feather-veined, the veins prominently marked, straight and simple or nearly so: fruit small: cyme peduncled.*

V. dentàtum, ARROW-WOOD (the stems having been used by the Indians to make arrows). Common in wet soil, 5° – 10° high, smooth, with ash-colored bark, pale and broadly ovate evenly sharp-toothed leaves, on slender petioles, and bright blue fruit.

V. mólle, SOFT A. From Kentucky S., soft-downy, with less sharply toothed oval or obovate leaves, on slender petioles, and blue oily fruit.

V. pubéscens, DOWNY A. Rocky grounds, N. & W.; a low and straggling shrub, with ovate or oblong and acute or taper-pointed leaves, having rather few coarse teeth, their lower surface and the very short petioles soft-downy; fruit dark purple.

+ + + *Leaves both coarsely toothed and somewhat 3-lobed, roundish, 3 – 5-ribbed from the base and veiny: cymes slender-peduncled, small: fruit red.*

V. acerifòlium, MAPLE-LEAVED A. or DOCKMACKIE. Shrub 3° – 6° high, in rocky woods, with 3-ribbed and 3-lobed leaves soft-downy beneath, their pointed lobes diverging; stamens slender.

V. pauciflòrum. Cold woods, only far N. or on mountains; with almost smooth leaves 5-ribbed at base and 3-lobed at summit; cyme few-flowered; fruit sour.

§ 2. *Flowers round the margin of the cyme neutral (without stamens or pistils) and very much larger than the fertile ones, Hydrangea-like and showy: petioles bearing evident appendages which imitate stipules: fruit red, sour.*

V. Ópulus, CRANBERRY-TREE. Tall and nearly smooth shrub, with gray bark, scaly buds, 3 – 5-ribbed and strongly 3-lobed leaves, the lobes pointed and commonly few-toothed, and cymes peduncled. The wild form in low grounds N. & E.; the juicy acid fruit bright red, used as a substitute for cranberries (whence the name of HIGH CRANBERRY-BUSH). The long-cultivated form from Europe, planted for ornament, under the name of GUELDER ROSE or SNOWBALL-TREE, has most of the flowers of the cyme changed into enlarged corollas.

V. lantanoides, HOBBLE-BUSH (popular name from the straggling or reclining branches taking root at the end, and forming loops; the botanical name because the leaves resemble the V. LANTÀNA or WAYFARING-TREE of

Europe, occasionally planted (but that has no enlarged neutral flowers): cold moist woods N., with naked buds, large round-ovate leaves heart-shaped at base and abruptly pointed at the apex, closely serrate, and pinnately many-veined, the veins and netted veinlets prominent underneath and covered, like the stalks and branchlets, with rusty scurf; cymes showy, very broad, sessile; fruit not eatable, coral-red turning crimson.

7. SAMBÙCUS, ELDER. (From Greek name of an ancient musical instrument, supposed to have been made of Elder stalks.)

S. Canadénsis, COMMON or BLACK-BERRIED ELDER. Alluvial soil, fence-rows, &c. Stems woody only towards the base, 5° – 6° high, with white pith, 7 – 11 oblong smooth or smoothish leaflets, the lowermost often 3-parted; flat cymes in early summer, and small black-purple fruit.

S. pùbens, RED-BERRIED E. Rocky woods chiefly N., with more woody stems and warty bark, yellow-brown pith, fewer and more lanceolate leaflets downy underneath, panicle-like or convex cymes, in spring, followed by bright red berries.

58. RUBIACEÆ, MADDER FAMILY.

Like the preceding family, but with stipules between the opposite (or sometimes ternately whorled) entire leaves, or else (in the true Madder Family) the leaves whorled without stipules. An immense family in the tropics, and here represented by several wild and a few commonly cultivated species. (The commonest in choice conservatories, not here described, are BURCHÉLLIA CAPÉNSIS, a shrub with a head of orange-scarlet flowers, the corolla almost club-shaped; MANÉTTIA CORDIFÒLIA, a twiner with ovate somewhat heart-shaped leaves, and long tubular somewhat 4-sided scarlet corollas, or M. BÍCOLOR, with lanceolate leaves, and corolla red toward the base, yellow toward the summit; PENTAS CÁRNEA, with ovate-oblong hairy leaves, and terminal cyme of handsome flowers, with salver-form flesh-colored corolla, hairy in the enlarged throat and 5-lobed.)

I. MADDER FAMILY PROPER. Leaves in whorls, without stipules. Ovary 2-celled, forming a small and twin, fleshy or berry-like, or else dry and sometimes bur-like, 2-seeded fruit. Calyx above the ovary obsolete.

1. RUBIA. Like the next, but the divisions of the corolla and the stamens 5. Fruit berry-like.
2. GALIUM. Flowers small or minute, mostly in clusters, with a wheel-shaped 4-parted (or sometimes 3-parted) corolla, and as many short stamens. Styles 2. Slender herbs, with square stems, their angles and the edges of the leaves often rough or almost prickly.

II. CINCHONA FAMILY, &c. Leaves opposite, or sometimes in threes or fours, and with stipules.

§ 1. *Only a single ovule and seed in each cell.*

* *Low herbs, with narrow funnel-form or salver-form corolla, its lobes (valvate in the bud) and the stamens 4.*

3. DIODIA. Flowers sessile in the axils of the narrow leaves. Stipules sheathing, dry, fringed with long bristles. Ovary 2-celled, in fruit splitting into 2 hard and dry closed nutlets.

4. MITCHELLA. **Flowers in pairs at the end of branches, the two ovaries united** *into one, which in fruit forms a 2-eyed scarlet berry.* Corolla densely white-bearded inside, white or purplish-tinged outside. Style 1: stigmas 4, slender. Seeds, or rather little stones, 4 to each of the two flowers. Stipules small, not fringed.

* * *Shrubs or small trees: lobes of the corolla overlapping in the bud.*

5. CEPHALANTHUS. Flowers many and small, crowded in a close round head raised on a peduncle. Calyx 4-toothed. Corolla tubular with 4 very short lobes. Stamens 4. Style long and much protruded, tipped with a capitate stigma. Fruit small, dry and hard, inversely pyramidal, at length splitting into 2 or 4 closed one-seeded portions.

6. COFFEA. Flowers in small clusters in the axils of the leaves. Calyx 4-5-toothed. Corolla with a short tube and 4 or 5 spreading lobes of about the same length. Stamens 4 or 5, with linear-oblong anthers. Style bearing 2 slender stigmas. Ovary 2-celled, becoming a small berry, containing 2 hard plano-convex seeds with a groove down the face (*coffee*), enclosed in a loose parchment-like hull.

§ 2. *Several or many ovules and seeds in each cell of the ovary and fruit.*

* *Shrubs or low trees, all except the first exotic house-plants.*

7. PINCKNEYA. Flowers in a terminal compound cyme. Calyx with 5 lobes, 4 of them small and lanceolate, the fifth often transformed into a large bright rose-colored leaf! Corolla hairy, with a slender tube and 5 oblong-linear recurving lobes. Stamens 5, protruding. Fruit a globular 2-celled pod, filled with very many thin-winged seeds.

8. GARDENIA. Flowers solitary at the end of the branches or nearly so, large, very fragrant. Calyx with 5 or more somewhat leaf-like lobes. Corolla funnel-shaped or salver-shaped, with 5 or more spreading lobes convolute in the bud, and as many linear anthers sessile in its throat. Style 1: stigma of 2 thick lobes. Fruit fleshy, surmounted by the calyx-lobes, ribbed down the sides, many-seeded.

9. BOUVARDIA. Flowers in clusters at the end of the branches. Calyx with 4 slender lobes. Corolla with a long and slender or somewhat trumpet-shaped tube, and 4 short spreading lobes, valvate in the bud. Anthers 4, almost sessile in the throat. Style 1: stigma of 2 flat lips. Pod small, globular, 2-celled. Seeds wing-margined.

* * *Low, native herbs.*

10. HOUSTONIA. Corolla salver-form or funnel-form, the 4 lobes valvate in the bud. Stamens 4. Style 1: stigmas 2. Pod short, 2-celled, the upper part rising more or less free from the 4-lobed calyx, opening across the top, and ripening rather few saucer-shaped or thimbel-shaped pitted seeds in each cell. Stipules short and entire, sometimes a mere margin connecting the bases of the opposite leaves.

1. RÙBIA, MADDER. (Name from Latin *ruber*, red, alludes to the red roots, which furnish the well-known red dye.)

R. tinctòria, COMMON or DYERS' M. Cult. from Eu. for the red roots, branching from the ground, 1° - 2° high, with angles of the stems and edges of the lance-oblong or oblanceolate leaves (mostly in sixes) very rough; flowers greenish, in summer; berry black. ♃

2. GÀLIUM, BEDSTRAW or CLEAVERS. (Name from Greek for milk, which some species in Europe were used to curdle.) Fl. summer. The following all wild species. Several have a red root like that of Madder.

§ 1. *Fruit a black berry, like that of Madder: but the parts of the white flower are only 4. Only in Southern States, in dry sandy soil.* ♃

G. hispídulum. Spreading stems 1° - 2° long; leaves in fours, ½' or less in length, lance-ovate; peduncle 1 - 3-flowered; berry roughish.

G. uniflòrum. Smooth, slender, 1° high; leaves linear; flowers mostly solitary.

§ 2. *Fruit dry when ripe, small.*

* *Smooth: leaves with strong midrib but no side ribs or nerves: flowers white, loosely clustered at the end of spreading branches.*

G. asprèllum, Rough Bedstraw. Low thickets: 3° - 5° high, as it were climbing, the backwardly prickly-roughened angles of the stem and edges and midrib of the lance-oblong pointed leaves adhering to contiguous plants; leaves in whorls of 6 on the stem and of 4 or 5 on the branchlets: flowers numerous.

G. trífidum, Small B. Swamps and low grounds, 6′ - 2° high, roughish or sometimes nearly smooth; leaves varying from linear to oblong, 4 - 6 in the whorls; flowers rather few, their parts often 3.

* * *Fruit smooth or slightly bristly: leaves 3-nerved: flowers white, in a narrow and long terminal panicle.* ♃

G. boreàle, Northern B. Rocky banks of streams N.; 1° - 2° high, smooth, erect, with lance-linear leaves in fours.

* * * *Fruit a little bur, being covered with hooked prickles.*

+ *Leaves mostly 6 or 8 in a whorl, with midrib and no side nerves: flowers whitish or greenish: stems reclining or prostrate, bristly-rough backwards on the angles.*

G. Aparìne, Cleavers or Goose-Grass. Low grounds: leaves in eights, lanceolate, rough-edged, 1′ - 2′ long; peduncles axillary, 1 - 2-flowered; fruit large. ①

G. triflòrum, Sweet-scented Bedstraw. Woodlands, especially N.: leaves mostly in sixes, lance-oblong, bristle-pointed; peduncles terminating the branches, 3-flowered. Sweet-scented in drying. ♃

+ + *Leaves all in fours, more or less 3-nerved: flowers not white: stems ascending, about 1° high, rather simple, not prickly-roughened.* ♃

G. pilòsum. Commonest S., in dry thickets: leaves oval, dotted, downy, 1′ long; flowers brown-purple or cream-colored, all pedicelled, the peduncle 2 - 3-times forked. Var. punctìculòsum is a smooth form S.

G. circæ̀zans, Wild Liquorice, the root being sweetish: common in thickets; leaves oval or oblong, obtuse, ciliate; peduncles once forked, their long branches bearing short-pedicelled dull or brownish flowers along the sides, the fruit reflexed.

G. lanceolàtum, like the preceding, common N.; but with lanceolate or lance-ovate tapering leaves, 2′ long.

3. DIÒDIA, BUTTON-WEED. (Name from Greek for *a thoroughfare,* being humble weeds, often growing by the wayside.) Fl. all summer, white or whitish.

D. Virgínica. Sandy banks from Maryland S.; with spreading stems 1° - 2° long, broadly lanceolate sessile leaves, salver-shaped corolla ½′ long, 2-parted style, and oblong fruit crowned with 2 calyx-teeth. ♃

D. tères. Sandy fields from N. Jersey and Illinois S.; with slender stems 3′ - 9′ long, linear and rigid leaves, small corolla rather shorter than the long bristles of the stipules, undivided style, and obovate little fruit crowned with the 4 short calyx-teeth. ①

4. MITCHÉLLA, PARTRIDGE-BERRY. (Named for *Dr. J. Mitchell,* who corresponded from Virginia with Linnæus.) Fl. in early summer. ♃

M. rèpens, the only species, common in woods; a little herb, creeping over the ground, with the small evergreen leaves round-ovate, very smooth and glossy, bright green, sometimes with whitish lines, short-petioled; the flowers pretty and sweet-scented; the scarlet fruit remaining over winter, eatable, but dry and almost tasteless.

5. CEPHALÁNTHUS, BUTTON-BUSH. (Name from Greek words for *head* and *flower.*) Fl. summer and autumn.

C. occidentàlis, the only species, is a tall shrub, common along the bor-

ders of ponds and streams, with lance-oblong or ovate-pointed leaves, on petioles, either in pairs or threes, and with short stipules between them; the head of white flowers about 1′ in diameter.

6. COFFÈA, COFFEE-TREE. (The Arabic name somewhat altered.)

C. Arábica, the species which produces Coffee, is a shrub or small tree, sometimes cult. in conservatories, with smooth and glossy oblong leaves, bearing fragrant white flowers in their axils, followed by the red berries, containing the pair of seeds.

7. PINCKNÈYA, GEORGIA BARK or FEVER-TREE. (Named by Michaux in honor of *Gen. Pinckney.*)

P. pùbens, the only species, is a rather downy small tree or shrub, in wet pine barrens, S. Car. to Georgia, with large oval leaves, slender stipules, and purplish flowers of little beauty, but the great calyx-leaf commonly produced is striking. This plant is of the same tribe with the CINCHONA or PERUVIAN BARK, and has similar medicinal (tonic) properties. Fl. early summer.

8. GARDÈNIA, CAPE JESSAMINE. Not an appropriate name, as the species so called does not belong to the Cape of Good Hope. (Named for *Dr. Garden* of South Carolina, who corresponded with Linnæus.)

G. flórida, CAPE JESSAMINE. A favorite house-plant from China, 2°–4° high, with smooth and bright-green oblong leaves acute at both ends, large and showy very fragrant flowers, the white corolla 5–9-lobed, or full double, and large oblong orange-colored berry 5–6-angled and tapering at the base.

9. BOUVÁRDIA. (Named for *Dr. Bouvard*, director of the Paris Garden of Plants over a century ago.)

B. triphýlla. Shrubby or half-shrubby house-plants, blossoming through the winter, and in grounds in summer, from Mexico, with ovate or oblong-ovate smoothish leaves, in threes or the upper in pairs, and scarlet corolla, minutely downy outside, nearly 1′ long.

B. leiántha, now commoner and winter-blooming, has more downy leaves and smooth deep-scarlet corolla.

10. HOUSTÒNIA. (Named by Linnæus for a *Dr. Houston*, an English physician, who botanized on the coast of Mexico, where he died early.)

* *Delicate little plants, with 1-flowered peduncles, flowering from early spring to summer: corolla salver-form: pod somewhat 2-lobed, its upper half free: seeds with a deep hole occupying the face.*

H. cærùlea, COMMON H. or BLUETS. Moist banks and grassy places, 3′–5′ high, smooth and slender, erect, with oblong or spatulate leaves only 3″ or 4″ long, very slender peduncle, and light blue, purplish, or almost white and yellowish-eyed corolla, its tube much longer than the lobes. ②

H. mínima. Dry hills from Ill. S. W.: roughish, 1′–4′ high, at length much branched and spreading; with leaves ovate, spatulate, or the upper linear, earlier peduncles slender, the rest short, and tube of the purplish corolla not longer than its lobes and those of the calyx. ① ②

H. rotundifòlia. Sandy soil from North Carolina S.: with prostrate and creeping leafy stems, peduncles shorter than the roundish leaves and recurved in fruit; corolla white. ♃

* * *Erect, leafy-stemmed, 5′–20′ high, with flowers in terminal clusters or cymes, in summer: corolla funnel-form: seeds rather saucer-shaped.* ♃

H. purpùrea. Wooded or rocky banks, commoner W.: smooth or slightly downy, with ovate or lanceolate 3–5-ribbed leaves, pale purple flowers, and upper half of globular pod free from the calyx.

Var. **longifòlia,** the common one N.; slender or low, with 1-ribbed leaves, those of the stem varying from lance-oblong to linear.

H. angustifòlia. Dry banks from Ill. S. & W., with tufted erect stems, narrow-linear and acute 1-ribbed leaves, crowded short-pedicelled flowers, lobes of the white corolla densely bearded inside, and only the top of the obovate pod rising above the calyx.

59. VALERIANACEÆ, VALERIAN FAMILY.

Herbs, with opposite leaves, no stipules, calyx coherent with the ovary, which has only one fertile one-ovuled cell but two abortive or empty ones, and stamens always fewer than the lobes of the corolla (1 – 3, distinct), and inserted on its tube. Style slender: stigmas 1 – 3. Fruit small and dry, indehiscent; the single hanging seed with a large embryo and no albumen. Flowers small, in clusters or cymes.

* *Lobes of the calyx many and slender, but hardly seen when in flower, being rolled up inwards around the base of the corolla; in fruit they unroll and appear as long plumose bristles, resembling a pappus, like thistle-down.*

1. VALERIANA. Corolla with narrow or funnel-form tube usually gibbous at the base on one side, but not spurred, its 5 spreading lobes almost equal. Stamens 3. Akene 1-celled, the minute empty cells early disappearing. Root strong-scented.
2. CENTRANTHUS. Corolla as in the preceding, but with a spur at the base. Stamen only one.

* * *Lobes of the calyx of a few short teeth or mostly hardly any.*

3. FEDIA. Corolla funnel-form, with 5 equal or rather unequal spreading lobes. Stamens mostly 3. Akene-like fruit with one fertile and two empty cells, or the latter confluent into one.

1. VALERIÀNA, VALERIAN. (Name from *valere*, to be well, alluding to medical properties, the peculiar-scented root of some species used in medicine.) Fl. early summer, often diœcious, white or purplish. ♃

* *Garden species from Europe, producing the medicinal Valerian-root.*

V. officinàlis, the commonest in gardens, 2° – 3° high, a little downy, with leaves of 11 to 21 lanceolate or oblong cut-toothed leaflets, and rootstocks not running.

V. Phu, is smoother, with root-leaves simple, stem-leaves of 5 – 7 entire leaflets or lobes, and rootstock horizontal.

* * *Wild species N. and chiefly W.: all rather rare or local.*

V. paucifiòra. Woodlands, Penn. to Illinois and S. W.; 1° – 2° high, smooth, with thin ovate and heart-shaped toothed root-leaves, stem-leaves of 3 – 7 ovate leaflets, rather few flowers in the crowded panicled cyme, and long slender corolla.

V. sylvàtica. Cedar swamps from Vermont W. & N.; with root-leaves mostly ovate or oblong and entire, stem-leaves with 5 – 11 lance-oblong or ovate almost entire leaflets; corolla funnel-form.

V. èdulis. Alluvial ground from Ohio W.; 1° – 4° high, with a large spindle-shaped root (eaten by the Indians W.), thickish leaves mostly from the root and minutely woolly on the edges, those of the root lanceolate or spatulate, of the stem cut into 3 – 7 long and narrow divisions.

2. CENTRÁNTHUS, SPURRED VALERIAN. (From Greek words for *spur* and *flower*.) Fl. summer. ♃

C. rùber, RED S. or JUPITER'S-BEARD. Cult. for ornament, from S. Eu.: a very smooth rather glaucous herb, 1° – 2° high, with lance-ovate nearly entire leaves, all the upper ones sessile, and cymes of small flowers in a narrow panicle, the corolla very slender, ½′ long, red, rarely a white variety.

3. FÈDIA, CORN SALAD, LAMB-LETTUCE. (Origin of the name obscure.) Our species are all very much alike in appearance, smooth, with forking stems 6′ – 20′ high, tender oblong leaves either entire or cut-lobed towards the base, and small flowers in clusters or close cymes, with leafy bracts, and a short white or whitish corolla, in early summer. They belong to the section (by most botanists regarded as a separate genus) VALERIANELLA. ① ②

F. olitòria, COMMON CORN SALAD of Eu., sparingly naturalized in the Middle States, has fruit broader than long, and a thick corky mass at the back of the fertile cell.

F. Fagopỳrum, from New York W. in low grounds, has ovate-triangular smooth fruit shaped like a grain of buckwheat when dry (whence the specific name), the confluent empty cells occupying one angle, and much smaller than the broad and flat seed.

F. radiàta, common from Penn. and Michigan S., has fruit mostly downy and somewhat 4-angled, the parallel narrow empty cells contiguous but with a deep groove between them.

60. DIPSACEÆ, TEASEL FAMILY.

Differs from the preceding family by having the flowers strictly in heads, surrounded by an involucre, as in the next family, — from which it differs in the separate stamens, hanging seed, &c. All are natives of the Old World.

1. DIPSACUS. Coarse and stout herbs, with stems and midrib of leaves often prickly, and the heads with rigid prickly-pointed bracts or chaff under each flower, under the whole a conspicuous leafy involucre. Each flower moreover has an *involucel* in the form of a little calyx-like body enclosing the ovary and akene. Calyx continued beyond the ovary into a mere truncate short cup-like border. Corolla slender, with 4 short lobes. Stamens 4. Style slender.
2. SCABIOSA. Less coarse, not prickly; the short heads surrounded by a softer green involucre; a short scale or soft bristle for a bract under each flower. Corolla funnel-form, 4 – 5-cleft, oblique or irregular; the outer ones often enlarged. Stamens 4. Style slender. Involucel enclosing the ovary and the calyx various.

1. DÌPSACUS, TEASEL. (Name from Greek word meaning *to thirst*; the united bases of the leaves in the common species catch some rain-water.) Fl. summer.

D. sylvèstris, WILD T. Run wild along roadsides, 4° – 5° high, prickly, with lance-oblong leaves, the upper ones united round the stem, large oblong heads, purplish or lilac corollas, and slender-pointed straight chaff under each flower. ②

D. fullònum, FULLER'S T. Less prickly than the other, with involucre hardly longer than the flowers, the awn-like tips of the rigid chaff hooked at the end, which makes the *teasel* useful for carding woollen cloth: cultivated in fields for this purpose, sometimes escaping into waste places and roadsides. ②

2. SCABIÒSA, SCABIOUS. (From Latin word for *scurfy*, perhaps from use of the plants to cure skin-diseases.) Fl. summer. One European species is commonly cultivated for ornament, viz.

S. atropurpùrea, SWEET S., or when with dark purple or crimson flowers called MOURNING BRIDE; the flowers are sometimes rose-colored or even white: plant 1° – 2° high, with obovate or spatulate and toothed root-leaves, pinnately-parted stem-leaves, the cup or involucel enclosing the ovary 8-grooved, calyx proper with 5 long bristles surmounting the akene; the outer corollas enlarged. ①

61. COMPOSITÆ, COMPOSITE FAMILY.

Herbs, or a very few shrubs, known at once by the "compound flower," as it was termed by the older botanists, this consisting of several or many flowers in a head, surrounded by a set of bracts (formerly likened to a calyx) forming an *involucre*, the stamens as many as the lobes of the corolla (almost always 5) and inserted on its tube, their *anthers syngenesious*, i. e. united in a ring or tube through which the style passes. Calyx with its tube incorporated with the surface of the ovary, its limb or border (named the *pappus*) consisting of bristles, either rigid or downy, or of teeth, awns, scales, &c., or of a cup or crown, or often none at all. Corollas either tubular, funnel-form, &c. and lobed, or strap-shaped (ligulate), or sometimes both sorts in the same head, when the outermost or marginal row has the strap-shaped corollas, forming *rays* (which answered to the corolla of the supposed compound flower), the separate flowers therefore called *ray-flowers;* those of the rest of the head, or *disk*, called *disk-flowers*. The end of the stalk or branch upon which the flowers are borne is called the *receptacle*. The bracts, if there are any, on the receptacle (one behind each flower) are called the *chaff* of the receptacle; the bracts or leaves of the involucre outside the flowers are commonly called *scales*. Style 2-cleft at the apex. Ovary 1-celled, containing a single ovule, erect from its base, in fruit becoming an akene. Seed filled by the embryo alone. For the flowers and fruit, and the particular terms used in describing them, see Lessons, p. 106 – 108, fig. 219 – 221, p. 112, fig. 229, 230; p. 130, fig. 291 – 296.

The largest family of Flowering Plants, generally too difficult for the beginner; but most of the common kinds, both wild and cultivated, are here briefly sketched. For fuller details as to the wild ones, with all the species, the student will consult the Manual, and Chapman's Southern Flora. There are two great divisions which include all the common kinds.

I. Head with only the outermost flowers strap-shaped, and these never perfect, i. e. they are either pistillate or neutral, always without stamens, or else with strap-shaped corollas entirely wanting. Plants destitute of milky or colored juice.

A. *No strap-shaped corollas or true rays.*

§ 1. *Thistles or Thistle-like, the heads with very many flowers, all alike and mostly perfect. Branches of the style short or united, even to the tip. Scales of the involucre many-ranked, these or the leaves commonly tipped with prickly or bristly points.*

Pappus of many long-plumed bristles: receptacle with bristles between the flowers.

1. CYNARA. Scales of the involucre of the great heads thickened and fleshy towards the base, commonly notched at the end, with or without a prickle. Akenes slightly ribbed. Otherwise much as in the next.
2. CIRSIUM. Scales of the involucre not fleshy-thickened, prickly-tipped or else merely pointed. Akenes flattish, not ribbed. Filaments of the stamens separate.

** * Pappus of naked, rough or short-barbed bristles, or none.*

+ Filaments of the stamens united into a tube. Leaves white-variegated.

3. SILYBUM. Scales of the involucre with the upper part leaf-like and spreading, spiny. Receptacle beset with bristles. Akenes flattened: pappus of many rather short and rigid bristles minutely bearded on their edges.

++ Filaments separate.

4. ONOPORDON. Heads and flowers as in true Thistles, No. 2. Receptacle naked and honeycombed. Akenes 4-angled, wrinkled: pappus of many slender bristles united at base into a horny ring. Stems strongly leaf-winged.
5. LAPPA. Scales of the globular involucre abruptly tipped with a spreading slender awl-shaped appendage, mostly hooked at its point. Receptacle bristly. Akenes flattened, wrinkled: pappus of many short and rough bristles, their bases not united, deciduous. Leaves and stalks not prickly.
6. CARTHAMUS. Outer scales of the involucre leaf-like and spreading, middle ones with ovate appendage fringed with spiny teeth or little spines, innermost entire and sharp-pointed. Receptacle beset with linear chaff. Akenes very smooth, 4-ribbed: pappus none. Leaves with rigid or short spiny teeth.
7. CNICUS and 8. CENTAUREA; see next division.

§ 2. *Thistle-like or Scabious-like, with many-ranked imbricated scales to the involucre, many-flowers, and the two branches of the style united into one body almost or quite to the tip, as in § 1: but the outer flowers of the head different from the rest and sterile, except in a few species of Centaurea. Receptacle beset with bristles.*

7. CNICUS. Outer flowers smaller than the rest, slender-tubular, sterile. Scales of the involucre tipped with a long spine-like appendage which is spiny-fringed down the sides. Akenes short-cylindrical, many-ribbed and grooved, crowned with 10 short and horny teeth, within which is a pappus of 10 long and rigid and 10 short naked bristles. Leaves prickly-toothed.
8. CENTAUREA. Outer flowers sterile and with corolla larger than the rest, often funnel-shaped and with long sometimes irregular lobes, forming a kind of false ray; but these are wanting in a few species. Involucre various, but the scales commonly with fringed, sometimes with spiny tips. Akenes flat or flattish: pappus of several or many bristles or narrow scales, or none.

§ 3. *Bur-like or achenium-like in the fruit, which is a completely closed involucre containing only one or two flowers, consisting of a pistil only, with barely a rudiment of corolla, therefore very different from most plants of the family; but the staminate flowers are several and in a flat or top-shaped involucre. Heads therefore monœcious, or rarely diœcious: no pappus. Coarse and homely weeds.*

9. XANTHIUM. Heads of staminate flowers in short racemes or spikes, their involucre of several scales in one row: fertile flowers below them, clustered in the axils, two together in a 2-celled hooked-prickly bur.
10. AMBROSIA. Heads of staminate flowers in racemes or spikes terminating the stem or branches, their involucre of several scales united in flattish or top-shaped cup; fertile flowers clustered below the staminate, only one enclosed in each small achenium-like involucre, which is naked, or with a few tubercles or strong points near the top in a single row.

§ 4. *Plants not thistle-like nor bur-like.*

** Two kinds of flowers in the same head, the outer ones with pistils only.*

+ Pappus none or a minute border or cup: no chaff among the flowers: scales of the involucre dry, often with scarious margins, imbricated. Bitter-aromatic or rather acrid plants.

11. TANACETUM. Heads of many yellow flowers; the marginal ones with pistil only and a 3-5-toothed corolla. Akenes angled or ribbed, with a flat top, crowned with a cup-like toothed or lobed pappus. Very strong-scented herbs, with heads in a corymb.
12. ARTEMISIA. Heads small, of few or many yellow or dull purplish flowers, some of the marginal ones pistillate and fertile, the others perfect, but sometimes not maturing the ovary. Akenes obovate or club-shaped, small at the top, destitute of pappus. Bitter-aromatic, and strong-scented plants, with heads in panicles.

+ + *Pappus none at all to the outer pistillate and fertile flowers, but of some slender bristles in the central and perfect yet seldom fruit-bearing flowers: scales of the involucre woolly.*

13. FILAGO. Heads small crowded in close clusters, of many inconspicuous flowers, each fertile pistillate flower in the axil of a thin and dry chaffy scale, and with a very slender thread-like corolla; the central flowers with a more expanded 4-5-toothed corolla. Low herbs, clothed with cottony wool: leaves entire.

+ + + *Pappus of all the flowers composed of bristles: no chaff among the flowers.*

14. ERECHTHITES. Heads of many whitish flowers, with a cylindrical involucre of many narrow and naked scales in a single row: outer flowers with very slender corolla: inner with more open tubular corolla. Akenes narrow: pappus of copious very fine and soft naked white hairs. Rank coarse herb.

87. ERIGERON. One species has such short and inconspicuous rays that it may be looked for here.

15. GNAPHALIUM. Heads of very many whitish or yellowish flowers, surrounded by an involucre of many ranks of dry and white or otherwise colored (not green) scarious and persistent scales woolly at base; the flowers all fertile, the outer ones with pistil and very slender corolla, the central ones perfect and with more expanded 5-toothed corolla. Pappus a row of very slender and roughish bristles. Cottony herbs.

16. ANTENNARIA. Like Gnaphalium, but the plants nearly or quite diœcious: the staminate flowers with a simple style, but the ovary sterile, and their pappus of stouter bristles which are thickened at the summit and there more or less barbed or plumed.

* * *Only one kind of flowers in the head.*

+ *Scales of the involucre dry and papery or scarious, often colored (i. e. not green), not withering.* (Everlastings.)

++ *Many flowers in the head: scales of the involucre in many ranks.*

16. ANTENNARIA. Flowers diœcious, in one plant all pistillate, with very slender corollas and a pappus of long and very fine hair-like naked bristles; in the other staminate (with a simple imperfect style), and the pappus of thicker bristles enlarging and somewhat plumed or barbed at their summit. Leaves and stems cottony.

17. RHODANTHE. Flowers perfect, with open 5-toothed yellowish corollas. Involucre (silvery or rose-colored), smooth, obovate or top-shaped. Akenes woolly: pappus of numerous plumose bristles. Leaves and stems smooth and naked.

18. AMMOBIUM. Flowers perfect, with yellow 5-lobed corollas, surrounded by a silvery-white involucre. Chaffy scales on the receptacle among the flowers. Akenes flattish-4-sided: pappus of 4 teeth, two of them prolonged into a bristle. Leaves and stems white-cottony, the latter with leaf-like wings.

++ ++ *Only 3 or 4 flowers in each head.*

19. HUMEA. Flowers perfect, purplish, surrounded by a few dry and scarious scales of the involucre: no chaff on the small receptacle. Akenes smooth: no pappus. Herbage green, not cottony: the small heads drooping in an ample compound panicle.

+ + *Scales of the involucre not dry and scarious or papery: flowers all perfect.*

++ *Flowers yellow, with chaff between them: akenes flat, bearing 2-4 awns or bristles.*

53. BIDENS, and 52. COREOPSIS: a few species have no ray-flowers.

++ ++ *Flowers yellow: no chaff: akenes not flat: pappus of copious very soft and fine down-like bristles.*

80. SENECIO, one or two species which are destitute of ray-flowers.

++ ++ ++ *Flowers not yellow nor orange: no chaff among them.*

a. *Branches of the style slender and rough all over with minute bristles.*

20. VERNONIA. Heads corymbed, with an involucre of many imbricated scales, and 15 to 30 or more rose-purple flowers. Lobes of the corolla slender. Akenes cylindrical, several-ribbed: pappus of copious hair-like bristles, surrounded at base by an outer set of very short and fine scales or scale-like bristles. Leaves alternate.

b. *Branches of the style long and slender or mostly rather club-shaped, smooth or very minutely puberulent under a lens.*

21\. LIATRIS. Heads of several or many rose-purple flowers, surrounded by a more or less imbricated involucre. Lobes of the corolla rather long. Akenes slender, about 10-ribbed: pappus of many long and slender bristles, which are plumose or else beset with a short beard or roughness for their whole length. Leaves alternate, entire.

22\. KUHNIA. Heads small, of 10 – 25 dull cream-colored flowers, surrounded by a few lanceolate scales of the involucre. Corolla slender, barely 5-toothed. Akenes cylindrical, many-striate: pappus a row of white plumose bristles. Leaves mostly alternate.

23\. MIKANIA. Heads of 4 flesh-colored flowers, with an involucre of only 4 scales. Corolla 5-toothed. Akenes 5-angled: pappus a row of hair-like naked (barely roughish) bristles. Leaves opposite; stem twining.

24\. EUPATORIUM. Heads of 3 or more flowers, and an involucre of several or many scales. Corolla 5-toothed. Receptacle flat or merely convex. Akenes 5-angled: pappus a row of hair-like naked (barely rough) bristles.

25\. CONOCLINIUM. Heads, &c. as in the preceding, but the receptacle conical. Flowers many, blue or blue-purple. Leaves opposite.

26\. AGERATUM. *Like the preceding; but the receptacle flattish, and the* pappus of a few chaffy scales, mostly tapering into a slender stiff rough bristle. Leaves opposite.

27\. PIQUERIA. Heads very small, of 3 – 5 white flowers, and involucre of 4 or 5 scales. Akenes 5-angled: pappus none. Leaves opposite, 3-ribbed.

c. *Branches of the style smooth, with a conical or flat unusally minutely hairy tip.*

28\. CACALIA. Heads corymbed, with 5 – 30 white or whitish flowers. Scales of the involucre a single row, with a few small bractlets at base. Corolla 5-cleft. Akenes oblong, smooth: pappus of very many fine and soft down-like naked bristles. Leaves alternate.

40\. BELLIS. A cultivated state of the Daisy, with *quilled* (monstrous) flowers may be sought here.

B. *With strap-shaped corollas or rays at the margin of the head.*

§ 1. *Herbage not spotted with large translucent or colored strong-scented glands.*

* *Pappus of copious hair-like bristles: no chaff on the receptacle among the flowers.*

+ *Rays yellow, except in one or two species of* Senecio *and one* Solidago, *pistillate.*

29\. TUSSILAGO. Ray-flowers very numerous and in many rows, fertile, with *narrow ligules; the tubular disk-flowers few in the centre, and not fertile.* Scale of the involucre nearly in one row. Pappus fine and soft. Head solitary on a scaly-bracted scape.

30\. SENECIO. Ray-flowers several in a single row, or sometimes none: the disk-flowers (as in all the following) perfect and fertile. Scales of the involucre in a single row, or often with small bractlets at the base. Pappus very fine and soft. Heads mostly in corymbs. Leaves alternate, simple or compound.

31\. ARNICA. Ray-flowers several or many in a single row. Scales of the involucre nearly equal in 2 rows. Pappus a single row of rough rather rigid bristles. Akenes slender. Heads few and rather large. Leaves opposite.

32\. INULA. Ray-flowers very numerous in one row, with narrow ligules. Outer scales of the involucre leaf-like. Pappus of many slender roughish bristles. Akenes narrow. Heads large and broad, the tubular perfect flowers very numerous, their anthers with two tails at the base. Leaves alternate.

33\. CHRYSOPSIS. Ray-flowers numerous in one row, scales of the involucre narrow, not leaf-like. Pappus of many roughish slender bristles, with also an outer row of very short and stout or chaff-like bristles. Akenes flattened, hairy. Heads single or corymbed. Leaves alternate.

34\. SOLIDAGO. Ray-flowers 1 – 8, or rarely 10 – 16, the tubular disk-flowers several, rarely many. Involucre oblong, its scales imbricated and appressed, of unequal lengths. Pappus a row of slender roughish bristles. Akenes narrow, terete, many-ribbed. Heads in panicled racemes, corymbs, or clusters, mostly small. Leaves alternate.

++ *Rays white, purple, blue, &c. never yellow, the flowers of the disk mostly yellow.* ASTERS *and the like. Leaves alternate, simple. Akenes flattened or flattish.*

35\. CALLISTEPHUS. Ray-flowers very numerous, usually in more than one row, or in cultivated varieties in several rows. Involucre in several rows, more or

less leafy. Pappus of many slender and roughish bristles, surrounded at base by a little cup or crown, consisting of many little scales or short stiff bristles more or less united. Heads solitary terminating leafy stems or branches, large and broad. Leaves sessile, coarsely toothed. Root annual.

36. ASTER. Ray-flowers more or less numerous in one row. Involucre imbricated Pappus of very numerous slender roughish bristles; no cup or crown of short bristles outside. Heads usually panicled or corymbed. Root usually perennial.

37. ERIGERON. Ray-flowers numerous, narrow, and commonly occupying more than one row. Involucre more simple than in Aster, the scales narrower, appressed, mostly of equal length and occupying only one or two rows, without any leaf-like tips; and the pappus more scanty, often some minute short and sometimes chaff-like bristles at the base of the long ones.

* * *Pappus not of long hair-like bristles, either a little cup or crown, or of a few scales, teeth, awns, &c., or none at all.*

+ *No chaff on the receptacle among the flowers, except in 41 – 43 and some cultivated and altered forms of 44. Leaves mostly alternate.*

++ *Akenes flat: rays pistillate, not yellow, at least in our species.*

38. BOLTONIA. Flowers resembling those of 36 and 37. Receptacle conical or hemispherical. Akenes very flat, obovate or obcordate with a callous margin or wing: pappus of several minute and short bristles, and commonly 2 or 3 short awns. Leafy-stemmed, tall, branching herbs, with pale-green thickish and chiefly entire leaves often turned edgewise.

39. BRACHYCOME. Flowers like those of 36 or 37. Receptacle conical. Akenes flat, wingless: pappus a ring of minute short bristles or narrow scales united into a short crown.

40 BELLIS. Heads with numerous white, reddish, or purple rays. Receptacle high conical. Akenes flat, obovate, wingless: no pappus. Low herbs, with solitary peduncled heads, and entire or merely toothed leaves.

41. ACHILLEA. Heads mostly with few and white (rarely rose-red or yellow) rays. Receptacle small, flattish, chaffy. Akenes oblong, margined: no pappus.

++ ++ *Akenes not flat, nor boat-shaped: pappus a short crown or none: rays pistillate and fertile except in 42.*

42. MARUTA. Rays neutral, white; otherwise almost exactly as in the next.

43. ANTHEMIS. Rays pistillate and fertile, numerous, white or sometimes yellow. Involucre of many small close-pressed scales. Receptacle convex, with some slender chaff, at least at the centre. Akenes terete, mostly ribbed. Leaves once to thrice pinnately divided.

44. CHRYSANTHEMUM, including LEUCANTHEMUM and PYRETHRUM. Rays pistillate and fertile, numerous. Receptacle convex or flat, without chaff, except in some double-flowered varieties. Disk-flowers mostly with a flattened tube. Pappus none. Otherwise nearly as in Anthemis.

++ ++ ++ *Akenes top-shaped or oblong, not flattened nor incurved: pappus of 5 – 10 conspicuous thin chaffy scales with midrib more or less extended into a bristle or awn: rays in one row, not very numerous, wedge-shaped, 3 – 5-cleft or lobed, yellow or partly reddish or brownish-purple, never white: involucre of separate scales.*

45. HELENIUM. Rays pistillate. Involucre of a few small and narrow spreading or reflexed scales. Receptacle globular or conical. Heads mostly corymbed. (Akene and pappus, Lessons, p. 130, fig. 294.)

46. GAILLARDIA. Rays neutral, often partycolored. Involucre of two or more rows of loose leafy-tipped scales. Receptacle convex. Disk-flowers often purple: the styles with very slender hispid branches. Heads solitary on slender terminal peduncles.

++ ++ ++ ++ *Akenes short, not incurved, covered with extremely long soft-silky hairs (which must not be confounded with pappus), hiding the minute pappus of many delicate little scales: rays numerous in one row, neutral, yellow with dark-colored spot at base, nearly entire: involucre of 2 or 3 rows of short scales united in a cup.*

47. GAZANIA. Head solitary on a long terminal peduncle, large and showy, the rays expanding only in sunshine or bright daylight. Receptacle flat. Disk-flowers yellow: their style abruptly thickened below the two short branches.

++ ++ ++ ++ ++ *Akenes incurved or boat-shaped, rough-tubercled on the back: no pappus: rays numerous in more than one row: flowers all yellow or orange.*

48. CALENDULA. Heads showy, solitary terminating the branches, with the very numerous rays pistillate and fertile, expanding in sunshine or bright daylight; the disk-flowers sometimes few in the centre and sterile. Involucre of numerous short green scales. Receptacle flat. Akenes all that mature belonging to the ray-flowers, strongly incurved, some of them even horse-shoe-shaped, or coiled into a ring, and (especially the outer ones) with thickened margins.

+ + *A chaff on the receptacle behind each flower.*

++ *Only the ray-flowers fertile or maturing their akenes; those of the disk, even if apparently perfect, always sterile: flowers all yellow. Coarse tall herbs.*

49. POLYMNIA. Heads rather small or middle-sized, with about 5 leaf-like scales to the involucre, and some thin and small inner ones, few or several ray-flowers producing turgid obovate or partly triangular akenes with no pappus. Herbage clammy-pubescent and rather strong-scented: all but the uppermost leaves opposite, and their petioles winged or dilated and stipule-like at the clasping base.

50. SILPHIUM. Heads mostly large, with numerous somewhat leafy-tipped or green scales to the involucre imbricated in 2 or more rows, numerous ray-flowers producing very broad and flat akenes (parallel with the scales of the involucre), which have commonly a wing-like margin and 2 teeth or a notch at the top. Juice resinous.

++ ++ *Disk-flowers perfect and fertile, those of the ray pistillate and fertile or neutral.*

a. *Akenes flattened parallel with the scales of the involucre and chaff of the receptacle, or in 53 sometimes very slender. Leaves generally opposite: involucre double; the outer mostly leaf-like, the inner of erect scales.*

51. DAHLIA. Rays in the natural flowers neutral or in the common species more or less pistillate, but in the gardens most or all of the flowers are changed into rays. Inner involucre of numerous more or less united scales. Akenes oblong, obscurely 2-horned or notched at the apex.

52. COREOPSIS. Rays usually 8, neutral, mostly yellow, or brown-purple at base. Involucre commonly of about 8 outer loose or leaf-like scales and as many erect inner ones. Chaff slender, deciduous with the flat akenes, which have mostly a pappus of 2 teeth or awns, the latter not barbed downwards.

53. BIDENS. Like Coreopsis, but several without rays, and some with slender or needle-shaped akenes; all bear 2 or more rigid persistent awns, which are barbed downwards!

b. *Akenes flattened if at all contrary to the scales of the involucre and the chaff of the receptacle, having the latter usually embracing or folded round their outer margin.*

= *Rays deciduous after flowering, yellow, sometimes brown-purple at base in* 60, 61, *or white in one of* 55. *Leaves either opposite or alternate in same genus, in* 54 – 56.

54. ACTINOMERIS. Rays neutral, few or several. Involucre of several nearly equal scales. Receptacle convex or conical. Akenes flat, oval, wing-margined: pappus of 2 persistent smooth awns. Leaves simple, serrate, often decurrent into wings on the stem.

55. VERBESINA. Rays few (in ours 1 – 5), pistillate. Involucre of few erect scales. Receptacle rather flat. Akenes flat, winged or wingless: pappus of 2 persistent awns. Leaves simple, decurrent into wings on the stem.

56. XIMENESIA. Rays numerous, pistillate. Scales of the involucre spreading. Receptacle flattish or convex. Akenes of the ray wrinkled and wingless; those of the disk flat and wing-margined, with two slender awns united to the wing. Leaves mostly with winged petioles which are dilated and clasping at the base.

57. HELIANTHUS. Rays several or many, neutral. Scales of the involucre imbricated. Receptacle flat or convex. Akenes flattish, more or less 4-angled or lenticular, marginless: pappus of 2 thin chaffy scales corresponding with the outer and inner angle of the akene, and sometimes with minute intermediate ones, all deciduous from the ripe fruit. (Lessons, p. 130, fig. 293.) Leaves simple, entire or serrate: stems not winged.

58. HELIOPSIS. Rays 10 or more, pistillate. Scales of the involucre in 2 or 3 rows, the inner shorter than the disk. Receptacle conical. Akenes 4-angled, somewhat cubical: no pappus. Leaves opposite, petioled, triple-ribbed.

59. RUDBECKIA. Rays several or numerous, neutral. Scales of the involucre in about 2 rows, spreading. Receptacle conical or columnar. Chaff soft. Akenes short, 4-angular, marginless, flat at the top: pappus none or a short even cup-border or border. Leaves alternate.

60. LEPACHYS. Like 59, but akenes flattened, wing-margined on the inner and sometimes on the outer edge, 1-2-toothed at summit. Disk grayish. Chaff short and truncate. Leaves alternate, pinnately compound.

61. DRACOPIS. Like 60, but involucre of some very small linear scales, and akenes terete, tapering to base, minutely striate, blunt at top, and the attachment at one side of the base. Leaves alternate, mostly entire, clasping.

= = *Rays rather persistent, long, drooping, pistillate but sterile, rose-purple.*

62. ECHINACEA. Rays numerous. Scales of the involucre narrow and spreading. Receptacle conical; the persistent and rigid spiny-tipped chaff longer than the purplish disk-corollas. Akenes thick and short, 4-sided, and with a toothed border for a pappus. Leaves chiefly alternate, 3-5-ribbed.

= = = *Rays persistent on the fruit, becoming dry and papery, broad, pistillate and fertile, of various colors.*

63. ZINNIA. Rays several. Receptacle conical; the oblong chaff not longer than the velvety-tipped disk-corollas. Akenes oblong or linear, flattened, or those of the ray 3-sided; pappus of a chaffy awn or tooth on each angle, or sometimes hardly any. Leaves opposite, sessile, and entire. Heads solitary, terminating the stem or branches.

§ 2. *Herbage, involucres &c. dotted with large pellucid or colored glands or oil-receptacles imbedded in their substance, making the plants strong-scented: involucre of one row of scales united into a bell-shaped or cylindrical cup: no chaff on the flattish receptacle: flowers yellow or orange.*

64. TAGETES. Rays pistillate. Involucre without bractlets at base. Akenes elongated, flat, somewhat 4-sided: pappus of 2 or more unequal rigid chaffy scales, often united into a tube or cup, sometimes tapering into awns. Herbs very glabrous.

65. DYSODIA. Rays pistillate, mostly short. Involucre with some loose bractlets at the base. Receptacle beset with short chaffy bristles. Akenes slender, 4-angled: pappus a row of chaffy scales dissected into numerous rough bristles, so as to appear at first sight as if capillary. Leaves opposite.

II. Head with all the flowers strap-shaped and perfect. Plants with milky juice. Leaves alternate. (No chaff on the receptacle in any of the following.)

§ 1. *Pappus of many minute chaffy scales, forming a short crown or cup.*

66. CICHORIUM. Head of several blue flowers. Involucre double; the outer of 5 short and spreading, the inner of about 10 erect scales. Akenes short, with broad summit. Stems twiggy, leafy mostly towards the base. (Lessons, p. 107, fig. 222; the akene, p. 130, fig. 292.)

§ 2. *Pappus of rather numerous and stout long-plumose bristles.*

67. TRAGOPOGON. Head large, of many yellow or purplish flowers. Involucre of about 12 lanceolate rather fleshy scales in a single row, somewhat united at the base. Akenes terete, slender, roughish, tapering into a long beak, which bears the rigid long-plumed bristles of the pappus, 5 of these longer and naked at the summit. Stems leafy; leaves entire, parallel-veined, clasping at the base.

68. LEONTODON. Head rather small, of many yellow flowers. Involucre of many narrow equal erect scales, and a few short bractlets at base. Akenes spindle-shaped: pappus a single row of tawny plumose bristles. Leaves all at the root or base of the scapes.

§ 3. *Pappus of very many slender, but rather stiff and rough, naked and tawny bristles.*

69. HIERACIUM. Heads small or smallish, of 12 or more yellow flowers. Scales of the involucre unequal and in more than one row. Akenes short, oblong or columnar, not beaked: the fragile bristles of the pappus not very copious. Stems naked or leafy.

70. NABALUS. Heads usually nodding, of 5-40 greenish-white or yellowish often purple-tinged flowers. Involucre cylindrical, of 5-15 linear scales in a single row and a few short bractlets at base. Akenes cylindrical: pappus of very copious straw-colored or brownish bristles. Stems leafy.

§ 4. *Pappus of extremely copious and fine soft hair-like naked bristles.*

* *Mature akenes with the pappus raised on a very long slender stalk-like beak.*

71. PYRRHOPAPPUS. Head of yellow flowers as in the next; but the pappus rusty red and with a minute ring of soft down underneath it. Stems branching and leafy near the base, the long peduncles naked.
72. TARAXACUM. *Head of very many yellow flowers on a slender hollow and* wholly naked scape. Involucre double, the inner of numerous narrow scales in a single row, the outer of short loose scales. Akenes terete or spindle-shaped, strongly ribbed and tubercled on the ribs, much shorter than its slender beak which elevates at maturity the soft and white pappus. (Lessons, p. 130, fig. 296.)
73. LACTUCA. Heads of several variously colored flowers. Involucre of several lanceolate or ovate imbricated scales of unequal length. Akenes flat, abruptly contracted into the slender beak which elevates the very white soft pappus. Stems leafy.

* * *Akenes with a short and thick beak or none: heads many-flowered.*

74. MULGEDIUM. Involucre as in 73. Flowers blue or bluish. Akenes flattened, short-beaked. Stems leafy.
75. SONCHUS. Involucre as in 73, or with narrow and more equal scales, and tumid at base. Flowers yellow. Akenes flat and short, without a beak to support its very soft white pappus. Stems branching and leafy. (Lessons, p. 130, fig. 295.)

1. CÝNARA, ARTICHOKE. (Ancient Greek name.) Two species occasionally cult. from the Old World, as esculents. ♃

C. **Scólymus,** True Artichoke, with stout stems, slightly prickly leaves mostly once or twice pinnatifid and cottony beneath, the ovate and usually pointless scales of the involucre and the receptacle of the young flower heads fleshy, and edible when cooked.

C. **Cardúnculus,** Cardoon, has the leaves more deeply and compoundly divided and prickly, the less fleshy scales of the head prickly-tipped; the fleshy leafstalks and midrib eaten after being blanched in the manner of celery.

2. CÍRSIUM, TRUE THISTLE. (Old Greek name.) Flowers purple or pink, occasionally yellow or white, in summer. ② ♃

§ 1. *All the scales of the head armed with spreading prickly tips.*

C. lanceolàtum, Common Thistle. Nat. from Eu. in pastures, &c.; the base of the rough deeply pinnatifid leaves running down the stem in lobed prickly wings; fl. purple. ②

§ 2. *All or most of the scales of the head appressed, the innermost not prickly-pointed, the outer with a short prickle or point, or none.*

* *Leaves green both sides or a little cottony or cobwebby underneath.*

C. arvénse, Canada T. A vile pest in fields and meadows N., nat. from Eu.: spreading by deep running roots as well as by seed: numerous short-peduncled heads only 1′ long, with rose-purple flowers; leaves moderately pinnatifid, weak-prickly. ♃

C. horrídulum, Yellow T. Wild near the coast in sandy ground; has very prickly leaves, rather large heads surrounded at base by an involucre or whorl of leaf-like very prickly bracts, and yellowish or purplish flowers.

C. pùmilum, Pasture T. Wild in dry fields, 1°–3° high, with lance-oblong pinnatifid leaves, single very large heads (almost 2′ across) of fragrant (purple or rarely white) flowers, sometimes leafy-bracted at base. ②

C. mùticum, Swamp T. Wild in swamps and low ground; 3°–8° high, with deeply divided leaves, few or no prickles, and rather large naked heads, most of the scales pointless; flowers purple. ♃

* * *Leaves white-cottony underneath: flowers purple, rarely white. Wild species.*

C. altíssimum, Tall T. Fields from Penn. and S.; 3°–10° high, branching, leafy up to the rather small heads, the oblong leaves wavy or only slightly pinnatifid, except the lowest. ② ♃

C. Virginiànum, Virginia T. Chiefly S. & W. on plains and barrens, with rather simple stems 1° – 3° high, ending in a long naked peduncle; leaves lanceolate and slightly or not at all pinnatifid; head small. ♃

C. díscolor, Two-colored T. Low grounds, 3° – 6° high, branching and leafy, with rather small heads, and deeply pinnatifid leaves green above white beneath, their lobes narrow and prickly pointed. ②

3. SÍLYBUM, MILK THISTLE. (An ancient Greek name.)

S. Mariànum, the only species, cult in some gardens and rarely running wild, from the Old World, well marked by its white-blotched or veined smooth leaves with clasping base and merely sinuate prickly margins; flowers purple, in late summer. ① ②

4. ONOPÓRDON, COTTON or SCOTCH THISTLE. (The ancient Greek name.)

O. Acánthium. Nat. from Eu. in waste places: tall, white-cottony, with weak prickles on the sinuate-pinnatifid leaves and the broad leaf-like wings of the stem and branches; flowers purple, late summer. ②

5. LÁPPA, BURDOCK. (Name from a Greek word meaning to *lay hold of*, from the burs or hook-awned heads.)

L. officinàlis, var. major, the Common B., with large leaves loosely cottony beneath, or somewhat naked, the lower heart-shaped, upper ovate, is common in manured soil and barnyards. Var. mìnor is smaller and smoother, with leaves tapering at the base, often cut-toothed or cleft. Fl. mostly purple, all summer and autumn. ① ②

6. CÁRTHAMUS, SAFFLOWER, FALSE SAFFRON. (Arabic name of the plant, from the properties of the orange-colored flowers, which are used in dying or coloring yellow, as a substitute for true Saffron.)

C. tinctòrius, the only common species, cult. in country gardens, from the Orient; smooth, 6′ – 12′ high, with ovate-oblong leaves and large head, in summer. ①

7. CNÌCUS, BLESSED THISTLE. (Greek name of a kind of Thistle.)

C. benedictus, the only species, scarce in waste places S., from Eu.; has much branched loosely woolly stems, leafy up to the rather small heads of yellowish flowers, and pale pinnatifid leaves with slightly prickly edges.

8. CENTAURÈA, CENTAUREA or STAR-THISTLE. (Ancient name, after *Chiron the Centaur.*) Fl. summer.

§ 1. *Flowers all alike in the head, the marginal ones not enlarged and ray-like: pappus of very short bristles: scales of head with dark-fringed appendage.*

C. nigra, Black C. or Knapweed. A coarse weed, in fields and waste places E., nat. from Eu.; stem 2° high; leaves roughish, lance-oblong, the lower with some coarse teeth; flowers purple. ♃

§ 2. *Marginal flowers more or less enlarged, forming a kind of false ray, and sterile: pappus of bristles; scales of head with fringed appendage.*

C. Cinerària, or candidíssima, a low species, cult. from S. Eu. with very white-woolly twice pinnatifid leaves, and purple flowers, the outermost little enlarged: not hardy N. ♃

C. Americàna. Cult. from Arkansas and Texas: smooth, with stout stem 1° – 2° high, oblong or lance-oblong leaves, the upper entire, very large head of showy pale purple flowers, the outer ones much enlarged, and the scales with large scarious-fringed appendage. ①

C. Cyànus, Bluebottle or Cornflower. In gardens, from Eu., sparingly running wild; loosely cottony, with stem-leaves linear and mostly entire,

solitary long-stalked head, the outer flowers very large and blue, with white or rose-colored varieties. ① ②

C. montàna. Cult. from Eu.: low and stout stems from creeping foot-stock, leaves lance-oblong, head larger, but flowers similar to last. ♃

§ 3. AMBERBÒA. *Marginal sterile flowers many: pappus of narrow chaff, or none: scales of head naked and smooth.* Cult. for ornament, from Asia.

C. odoràta, or AMBERBOI, SWEET SULTANA. Smooth, with mostly pinnatifid leaves, long-stalked head of yellow fragrant flowers, the outer ranks enlarged, and chaffy-bristled pappus. ①

C. moschàta, MUSK-SCENTED S., has rose-purple or white musk-scented flowers, the outer little enlarged, and no pappus. ①

9. XÁNTHIUM, COCKLEBUR, CLOTBUR. (Name from the Greek for *yellow*, the plants said to yield that color.) Coarse and vile weeds, with stout and low branching stems, alternate and petioled merely toothed or lobed leaves, and obscure greenish flowers, produced all summer. ①

X. strumàrium, COMMON C. Barnyards and waste manured ground: rough, 1° – 2° high, with broadly triangular-heart-shaped toothed or slightly lobed leaves on long petioles; the fruit a bur fully ½′ long, with 2 straightish beaks at the apex.

Var. **echinàtum,** on sandy shores, has a turgid bur 1′ long, with incurved beaks and more numerous prickles, beset with glandular bristles.

X. spinòsum, SPINY C. Sandy shores and waste places, E. & S. Hoary; the branching stems armed with slender triple prickles at the base of the narrow short-petioled leaves; bur small, with a single beak-like tip.

10. AMBRÒSIA, RAGWEED. (The classical name means *food for the Gods:* perhaps sarcastically applied to these miserable weeds.) Leaves opposite or the upper alternate, mostly lobed or cut: flowers greenish, all summer and autumn. ①

A. trífida, GREAT RAGWEED. Tall coarse herb along low borders of streams, 4° – 10° high, rough, with opposite deeply 3-lobed leaves on margined petioles, the lobes lance-ovate and serrate, staminate heads in racemes, their involucres 3-ribbed on one side, the fertile one or fruit obovate and with 5 or 6 ribs ending in a tubercle or spiny point.

A. bidentàta. Prairies from Ill. S., 1° – 3° high, hairy, very leafy; the leaves alternate, closely sessile, lanceolate, and with a short lobe or tooth on one side near the base; heads in a dense spike, the top-shaped involucre of the sterile ones with a large lanceolate appendage on one side.

A. artemisiæfòlia, ROMAN WORMWOOD, HOGWEED, or BITTERWEED. Waste places and roadsides, 1° – 3° high, hairy or roughish; with twice pinnatifid leaves either opposite or alternate, pale or hoary beneath, staminate heads in panicled racemes or spikes, the small roundish fruit with about 6 little teeth or spines.

11. TANACÈTUM, TANSY. (Old name, said to be a corruption of *Athanasia*, undying, from the durable flowers.) Fl. all summer. ♃

T. vulgàre, COMMON TANSY, from Eu.: cult. in old gardens, and a roadside weed, 2° – 4° high, smooth, strong-scented and acrid, with deep green 1 – 3-pinnately compound leaves, the leaflets and winged margins of the petiole cut-toothed; in var. CRÍSPUM, leaves more cut and crisped.

T. Balsamìta, COSTMARY: a garden herb, from Eu., 1° – 2° high, smooth, with pleasant scent, the pale leaves oblong and nearly toothed, and small heads of pale yellow flowers.

12. ARTEMÍSIA, WORMWOOD. (Dedicated to *Artemis*, the Greek Diana.) Fl. summer.

* *Leaves hoary or cottony, at least underneath.* ♃

A. Absínthium, COMMON WORMWOOD, from Eu.; in old gardens and a roadside weed; strong-scented, silky-hoary, with stems 2° – 4° high and rather

woody at base, twice or thrice pinnately parted leaves with lanceolate lobes, and nodding hemispherical heads.

A. vulgàris, MUGWORT of Eu.; in old gardens and roadsides, with pinnatifid leaves green above and cottony-white beneath, their lance-linear divisions mostly cut and cleft, and small heads in open panicles.

A. Ludoviciàna, WESTERN M., is wild from Michigan W. and S. W., with lanceolate leaves mostly cottony-white on both sides, many of them entire or merely toothed, and larger heads in narrow or spike-like panicles.

* * *Leaves (and whole plant) smooth and green or nearly so,*

+ *Not very fine or finely cut.*

A. biénnis, BIENNIAL WORMWOOD. Gravelly banks and shores N. W., extending E. along railroads; 1° – 3° high, with small greenish heads much crowded in the axils the once or twice pinnatifid leaves, their lobes linear, in the lower cut-toothed. ① ②

A. Dracúnculus, TARRAGON, is sparingly cult. from Eu. for the aromatic (lance-linear entire) leaves, used as a condiment. ♃

+ + *Very fine thread-like or capillary divisions to the 1 – 3-pinnately divided leaves: heads loosely panicled.*

A. Abrótanum, SOUTHERNWOOD, from S. Eu.; cult. in gardens for the pleasant-scented foliage, 3° – 5° high, woody-stemmed. ♃

A. caudàta, is a wild Wormwood along the sandy coast and lake shores, 2° – 4° high. ②

13. FILÀGO, COTTON-ROSE. (Latin name, from the cottony hairs.)

F. Germánica, GERMAN C. or HERBA IMPIA of the old herbalists, branches with a new generation of clustered heads rising out of the parent cluster at the top of the stem (as if undutifully exalting themselves); stems 5′ – 10′ high, crowded with the lanceolate erect and entire cottony leaves. Old dry fields from New York S.; fl. summer and autumn. ①

14. ERECHTHÌTES, FIREWEED. (Ancient name of some Groundsel, after *Erechtheus*.) Fl. summer and autumn. ①

E. hieracifòlia, one of the plants called FIREWEED, because springing up where woods have been cleared and ground burned over, especially N.: very rank and coarse herb, often hairy, 1° – 5° high, with lanceolate or oblong cut-toothed leaves, the upper with auricled clasping base, and panicled or corymbed heads of dull white flowers, in fruit with copious white and very soft downy pappus.

15. GNAPHÀLIUM, EVERLASTING, IMMORTELLE, CUDWEED. (Name from Greek, meaning *lock of wool.*) Fl. summer and autumn.

§ 1. *Wild species with crowded small heads, the slender pistillate flowers very numerous and occupying several rows.*

* *Scales of the involucre white or yellowish-white: stem erect, 1° – 2° high: heads many, corymbed. Common in old fields, copses, &c.*

G. polycéphalum, COMMON EVERLASTING. Leaves lanceolate, with narrowed base and wavy margins, the upper surface nearly naked; the perfect flowers few in the centre of each head. ①

G. decúrrens, DECURRENT E., equally common from New Jersey to Michigan and N.; leaves lance-linear, cottony both sides, the base partly clasping and extending down on the stem; many perfect flowers in the centre of each head. ♃

* * *Scales of the involucre tawny-purplish or whitish, not at all showy or petal-like: heads small, crowded in sessile clusters: stems spreading or ascending, 3′ – 20′ high.* ①

G. uliginòsum, LOW CUDWEED. A most common, insignificant little weed in wet places, especially roadsides, with lanceolate or linear leaves, and inconspicuous heads in terminal clusters.

G. purpùreum, PURPLISH C. *In sand or gravel along and near the sea-shore*: taller, with oblong-spatulate or lanceolate leaves green above and white-cottony beneath, and purplish heads in axillary clusters, or spiked along the upper part of the stem.

§ 2. *Ornamental exotic* IMMORTELLES *in the gardens, these in strictness named* HELICHRYSUM, *with pistillate flowers fewer or in a single marginal row.*

G. bracteàtum, or HELICHRYSUM BRACTEATUM, from Australia: tall, smoothish or slightly downy, with lanceolate leaves, large heads terminating the branches and with some leaf-like bracts on the peduncle, the permanent and very numerous scales of the involucre very showy and petal-like, spreading in *many ranks, golden yellow, and with white varieties.* ② ①

G. (or **H.**) **macrànthum,** from Australia, is less tall (1° – 2° high), with roughish stem and lance-oblong or spatulate leaves green throughout, and the showy solitary heads nearly 2′ across; the scales of the involucre rose-red, or white on the upper face. ♃ ①

16. ANTENNÀRIA, EVERLASTING, IMMORTELLE.

(Name from the club-shaped pappus of the staminate flowers, which resembles the *antennæ* of certain insects.) ♃

A. margaritàcea, PEARLY EVERLASTING. Dry fields and woods, especially N., fl. in summer: stem about 2° high, leafy to the top; the leaves lance-linear; heads in a broad corymb, the fertile ones with a few imperfect staminate flowers in the centre; scales of the involucre pearly white, rounded.

A. plantaginifòlia, PLANTAIN-LEAVED E. Dry knolls and slopes, fl. early *spring: in patches, spreading by runners and offsets; the root-leaves* spatulate or obovate and tufted; flowering stems 4′ – 8′ high, with few and small lanceolate leaves; heads in a small corymb, the fertile ones with narrow and acutish, the staminate with white and rounded scales.

17. RHODÁNTHE.

(Name from Greek words for *rose* and *flower*, from the rose-colored pearly heads, which in cultivation are sometimes white.) ①

R. Manglèsii, cult. in gardens for ornament, from Australia: a low smooth herb, with oblong and alternate clasping entire leaves, and loosely corymbed showy nodding heads of yellow flowers, the pearly involucre obovate or obconical, smooth, rose or white, very ornamental, in summer.

18. AMMÒBIUM.

(Name from Greek words meaning *living in sand.*) ①

A. alàtum, of Australia, cult. for ornament: 1° – 3° high, rather cottony, with root-leaves oblong and tapering downwards into a petiole; stem-leaves small and lanceolate, and extended down the branches and stems in the form of leaf-like wings; heads solitary with pearly white involucre surrounding yellow flowers.

19. HÙMEA.

(Named for Lady Hume.) From Australia, cult. for ornament. ①

H. élegans. Tall, 3° – 6° high when in flower, with simple stem thickly set with the alternate lance-ovate and clasping green leaves, the summit branching into a large drooping panicle, its branches slender, bearing very numerous and small purplish heads.

20. VERNÒNIA, IRON-WEED.

(Named for a *Mr. Vernon*, of England, who travelled in this country.) Fl. autumn. ♃

V. Noveboracénsis, NEW YORK OR COMMON IRON-WEED. Near the coast and along rivers: 3° – 6° high, with lanceolate serrate leaves, crowded along the whole height of the stem, heads in a broad corymb, and scales of involucre with slender awl-shaped or awn-like tips.

V. fasciculàta, only W. & S. in prairies, &c., has the scales of involucre blunt and pointless, except perhaps some of the lowest.

V. angustifòlia, only S., has narrow linear and more scattered leaves.

21. LIATRIS, BUTTON-SNAKEROOT or BLAZING-STAR. (An unexplained name.) Chiefly in pine-barrens or sandy soil. Fl. late summer and autumn. ♃

§ 1. *Stem commonly wand-like and simple, rising from a round corm or short tuber, very leafy with narrow and entire often grass-like leaves: heads spiked or racemed, or occasionally branching into a panicle, with imbricated involucre: lobes of the rose-purple corolla long and slender.*

* *Bristles of the pappus plainly plumose to the naked eye.*

+ *Heads small, only 4 – 5-flowered.*

L. tenuifòlia, in S. pine-barrens, has very slender mostly thread-shaped leaves, stem 2° – 4° high, very slender raceme, and scales of involucre erect and pointed.

L. élegans, from Virginia S.; 2° high, often hairy or downy, with compact spike, short lanceolate or linear leaves, and scales of involucre with spreading rose-purple tips.

+ + *Heads large and fewer, cylindrical, many-flowered.*

L. squarròsa, Common Blazing-Star; from Penn. S. & W.; 1° – 3° high, with linear leaves, few heads about 1′ long, and scales of involucre with spreading leaf-like tips.

L. cylindràcea, from W. Canada S. W., smaller than the preceding, 6′ – 18′ high, the narrow heads with short and rounded appressed tips.

* * *Bristles of the pappus not plainly plumose to the naked eye.*

+ *Heads 30 – 40-flowered, commonly an inch broad.*

L. scariòsa, with stout stem 2° – 5° high, lanceolate leaves, or the lower spatulate-oblong, and very numerous scales of the involucre with rounded tips, often scarious or purple on the margins.

+ + *Heads 3 – 15-flowered, from ¼′ to ½′ long: stem 2° – 5° high.*

L. pycnostàchya, in prairies W., with linear or lance-linear leaves, and a very dense spike of about 5-flowered heads, the scales of the involucre with recurving purplish tips.

L. spicàta, the commonest species; in low grounds, with 8 – 12-flowered heads crowded in a long spike, the oblong and blunt scales of involucre without any obvious tips.

L. graminifòlia, in wet pine-barrens from New Jersey S., has 7 – 12-flowered heads in a looser spike or raceme, the rigid appressed scales blunt or slightly pointed.

L. grácilis, from N. Carolina S., with spreading leaves, the lower lance-oblong and long-petioled, the others linear and short, and 3 – 7-flowered small heads on spreading pedicels.

§ 2. *No tuber or corm: leaves broad: heads small, in a corymb.*

L. odoratíssima, Vanilla-plant of low pine-barrens S. (also wrongly called Hound's-tongue): 2° – 3° high, very smooth, with pale obovate or oblong leaves which are vanilla-scented in withering, the heads 7 – 8-flowered, involucre of few scales, and pappus not plumose.

22. KÙHNIA. (Named by Linnæus for *Dr. Kuhn* of Pennsylvania.)

K. eupatorioides, the only species from New Jersey to Wisconsin S., is a rather homely herb, with lanceolate leaves, and panicled or corymbed small heads of flowers, in autumn. ♃

23. MIKÁNIA, CLIMBING HEMPWEED. (Named for a Bohemian botanist, *Prof. Mikan.*)

M. scándens, a rather handsome plant, climbs over bushes in low grounds, with triangular-heart-shaped or halberd-shaped leaves, and small heads of purplish flowers, in summer. ♃

24. EUPATÒRIUM, THOROUGHWORT, BONESET. (Old name, dedicated to *Eupator Mithridates*, who is said to have used the European species in medicine. Most of the species are American.) ♃

E. glechonophýllum, of Chili, and one or two other somewhat woody-stemmed and white-flowered species are cultivated in greenhouses for winter-blooming. — The following are the commonest wild species; fl. late summer and autumn.

§ 1. *Leaves 3 – 6 in a whorl: heads 5 – 15-flowered, cylindrical, the purplish scales closely imbricated in several rows: flowers flesh-colored.*

E. purpùreum, PURPLE T. or JOE-PYE WEED. Low grounds, with simple stems 3° – 12° high, with or without purplish spots or dots, very veiny oblong-ovate roughish-toothed and pointed leaves on petioles, and dense compound corymbs.

§ 2. *Leaves opposite (or only the uppermost alternate) and sessile: heads corymbed, the scales more or less imbricated: flowers white.*

* *Leaves united at base around the stem in pairs (connate-perfoliate).*

E. perfoliàtum, THOROUGHWORT or BONESET. Low grounds everywhere (the bitter infusion used as a popular medicine), 2° – 4° high, hairy; the lanceolate leaves taper-pointed, serrate, very veiny and somewhat wrinkled, 5′ – 8′ long; the very numerous heads crowded in a dense corymb, 10 – 30-flowered.

* * *Leaves separate at base: heads mostly 5 – 8-flowered.*

E. sessilifòlium, on shady banks, is smooth, 4° – 6° high, with lance-ovate serrate leaves (3′ – 6′ long) tapering from a rounded closely sessile base to a slender point, and small heads in very compound flat corymbs.

E. pubéscens, in dry soil chiefly near the coast, only 2° high, with ovate acute and toothed downy leaves, and 7 – 8 flowers in the heads.

E. rotundifòlium, in similar places and like the foregoing, but with roundish-ovate blunt leaves more deeply toothed, and 5-flowered heads.

E. teucrifòlium, in low grounds near the coast, roughish-pubescent, with ovate-oblong or lance-oblong veiny deeply few-toothed leaves and small corymbs.

E. álbum, in sandy soil from New Jersey S., 2° high, is roughish-hairy, with oblong-lanceolate coarsely toothed and strongly veiny leaves, and heads crowded in the corymb, the lanceolate and pointed scales of the involucre white above and larger than the flowers.

E. altíssimum, in dry soil from Penn. to Ill. and S., is stout and tall, 3° – 7° high, downy, with lanceolate leaves (resembling those of some Golden-rods) tapering to both ends and conspicuously 3-nerved, either entire or toothed above the middle; corymbs dense; scales of the involucre blunt.

E. hyssopifòlium, in dry, sterile soil, from Mass. S., 1° – 2° high, smoothish, with narrow linear or lanceolate blunt 1 – 3-nerved leaves.

§ 3. *Leaves alternate or the lower opposite, all long-petioled: corymbs compound: flowers 12 – 15 in the head, small, white.*

E. serótinum, in low grounds from Maryland to Ill. & S., minutely pubescent, tall (3° – 6° high), bushy-branched; leaves ovate-lanceolate and taper-pointed, triple-ribbed, coarsely toothed, 5′ – 6′ long; the involucre very downy.

§ 4. *Leaves opposite, petioled, triple-ribbed: heads in corymbs, 8 – 30-flowered, the scales of the involucre equal and almost in one row: flowers white.*

E. ageratoides, WHITE SNAKE-ROOT. Common in woods, especially N., 2° – 3° high, smooth, with broadly ovate long-petioled coarsely and sharply toothed thin leaves (4′ – 5′ long), and heads of handsome pure-white flowers in compound corymbs.

E. aromáticum, like the preceding, but commoner S. and only near the coast; more slender, usually less smooth, with thicker leaves more bluntly toothed on short petioles, the corymbs usually less compound.

25. CONOCLÍNIUM, MIST-FLOWER. (Name from Greek, means *conical receptacle*, in which alone it differs from Eupatorium, i. e. from such species as those of the last section.) ♃

C. cœlestinum, in rich soil from Penn. to Ill. and S., sometimes cult. for ornament, 1° – 2° high, with triangular-ovate or slightly heart-shaped coarsely toothed leaves, and a flat corymb of small heads of blue-purple flowers, in autumn.

26. AGÉRATUM. (An ancient Greek name, which means *not growing old*, probably applied originally to some sort of Everlasting.)

A. conyzoides, the variety with azure-blue flowers called A. Mexicànum, cult. for ornament from Trop. Amer.; 2° – 3° high, soft-downy, with ovate or somewhat heart-shaped petioled leaves, and corymbed heads of azure-blue flowers, produced all summer and autumn. ①

27. PIQUÈRIA. (Named for an obscure Spanish botanist, *Piquerio*.)

P. trinérvia, from Mexico, cult. for winter-blooming; smooth, 2° – 3° high, branched, with lance-oblong 3-nerved sparingly serrate leaves, and loose panicled corymbs of very small white-flowered heads; much used for dressing larger cut flowers. ①

28. CACÀLIA, INDIAN PLANTAIN. (Ancient name, of uncertain meaning.) Natives of rich soil, fl. mostly in late summer. ♃

* *Receptacle flat: involucre with some bracts at the base.*

C. suavèolens, from Conn. to Wisconsin and S., but rare; 3° – 5° high, with halberd-shaped serrate leaves on winged petioles, and rather large heads of 20 – 30 flowers.

* * *Receptacle pointed in the middle: involucre 5-flowered, of 5 scales, naked.*

C. renifórmis, Great I., from New Jersey to Illinois and S. along the mountains, 4° – 9° high, with large and green repand-toothed petioled leaves, the lower kidney-shaped, the upper fan-shaped.

C. atriplicifòlia, Pale I. Commoner S.: pale or glaucous, with coarsely toothed or angled leaves, the lower almost kidney-shaped, the upper wedge-shaped.

C. tuberòsa, Tuberous I. Wet prairies W., with angled stem and green thickish 5 – 7-nerved mostly entire leaves, the lower lance-oval and tapering into long petioles, the upper short-petioled. Flowers in early summer.

29. TUSSILÀGO, COLTSFOOT. (Name from the Latin *tussis*, a cough, for which the plant is a popular remedy.) ♃

T. Fárfara, the only species, is wild along brooks, damp roadsides, and near dwellings N., probably introduced from Europe, spreading very much by its creeping (mucilaginous and bitter) rootstocks, which send up, in earliest spring, scaly-bracted scapes, 3′ – 6′ high, bearing a single Dandelion-like head, followed by the rounded and somewhat angled or toothed heart-shaped or kidney-shaped leaves, which are cottony beneath when young.

30. SENÈCIO, GROUNDSEL.[3] (Name from the Latin *senex*, an old man, referring to the hoary hairs of many species, or to the white hairs of the pappus.)

§ 1. *Wild species, chiefly of low or wet grounds, with yellow flowers.*

* *No ray-flowers, introduced from Eu.: fl. all summer.* ①

S. vulgàris, Common Groundsel; a low weed in waste or cultivated grounds E., corymbose, nearly smooth, with pinnatifid and toothed leaves.

* * *With ray-flowers, native herbs: fl. spring and early summer.*

S. lobàtus, Butterweed. Low banks of streams S. & S. W., very smooth, 1° – 3° high, with tender lyrate-pinnatifid or pinnate and variously lobed leaves, small heads in naked corymbs, and about 12 conspicuous rays. ①

S. aùreus, Golden Ragwort or Squaw-weed. Cottony when young, becoming smooth with age, sometimes quite smooth when young, with simple stems 1° – 3° high, root-leaves simple and in different varieties either round, obovate, heart-shaped, oblong, or spatulate, crenate or cut-toothed, on slender petioles, lower stem-leaves lyrate, upper ones sessile or clasping and cut-pinnatifid; corymb umbel-like; rays 8 – 12. ♃

§ 2. *Exotic species, cultivated for ornament from the Old World.*

* Emília, *or* Cacàlia, *of the older botanists, with no rays, but many orange-red disk-flowers in a very simple cup-like involucre: akenes with* 5 *acute and hispid-ciliate angles.* ①

S. sonchifòlia, Tassel-Flower: cult. as a summer annual, from India, very smooth or a little bristly, pale or glaucous, 1° – 2° high, with root-leaves obovate and petioled, stem-leaves sagittate and partly clasping, and rather showy heads in a naked corymb, in summer.

* * *Heads with no rays and only* 6 – 12 *disk-flowers, small, yellow: stem extensively climbing, more or less twining.*

S. scándens, cult. as house plant under the name of German Ivy, but is from Cape of Good Hope, and resembles Ivy only in the leaves, which are round-heart-shaped or angled and with 3 – 7 pointed lobes, soft and tender in texture, and very smooth: the flowers seldom produced. ♃

* * * Cineraria. *Heads with rays and numerous disk-flowers: not climbers.*

+ *Flowers all yellow.* ♃

S. Cinerària, or Cinerària marítima, of Mediterranean coast, an old-fashioned house-plant, ash-white all over (whence the name *Cineraria* and the popular one of Dusty Miller) with a woolly coating; the branching stems somewhat woody at base; leaves pinnately parted and the divisions mostly sinuate-lobed; the small heads in a dense corymb.

S. Kæmpferi, of Japan and China, is most probably the original of the Farfùgium grándе, lately introduced into the gardens, where it hardly ever flowers: it is cultivated for the foliage, the thick and smooth rounded and angled rather kidney-shaped root-leaves blotched with white; some of the flowers more or less 2-lipped. ♃

+ + *Ray-flowers purple, violet, blue, or varying to white, those of the disk of similar colors or sometimes yellow.*

S. Heretièri, or Cinerària lanàta, from Teneriffe, with woody base to the stem, rounded heart-shaped 5 – 7-lobed leaves on slender petioles, very white-cottony beneath but soon smooth and green above, and peduncle bearing solitary rather large head of purple flowers, is a less common house-plant than the next. ♃

S. cruéntus, the Common Cineraria of the greenhouses, from Teneriffe, is herbaceous, smoothish, with the heart-shaped and angled more or less cut-toothed leaves green above and usually crimson or purple underneath, the lower with wing-margined petioles dilated into clasping auricles at the base; heads numerous in a flat corymb, the handsome flowers purple, crimson, blue, white, &c. ♃

S. élegans, Purple Ragwort, from Cape of Good Hope, a smooth herb, with deeply pinnatifid leaves, the lower petioled, the upper with half clasping base, the lobes oblong and often sinuate-toothed; heads corymbed, with yellow or purple disk-flowers and purple or rarely white rays. ① And a full-double variety, having the disk-flowers turned into rays. ♃

31. ÁRNICA. (Old name, thought to be a corruption of *Ptarmica*.) The common European species is used in medicine. The following probably has similar properties. ♃

A. nudicaùlis, so called for the naked stem, which bears only 1 or 2 pairs of small leaves, although 1° – 3° high, the main leaves being clustered at the root, thickish, sessile, ovate or oblong, 3 – 5-nerved, mostly entire hairy; heads several, loosely corymbed, pretty large and showy, in spring. Low pine-barrens from S. Penn. S.

32. ÍNULA, ELECAMPANE. (Ancient Latin name.) Fl. summer. ♃

I. Helènium, COMMON ELECAMPANE. In old gardens and nat. from Eu. by roadsides; a stout herb, with stems 3° – 5° high from a thick mucilaginous root (used in medicine), large entire leaves woolly beneath, those from the root ovate and petioled, the others partly clasping; heads large, but the rays very narrow.

33. CHRYSÓPSIS, GOLDEN ASTER. (Name from two Greek words meaning *golden in appearance*, from the yellow flowers.) Low herbs, wild chiefly S. & W., in dry and barren or sandy soil: fl. summer and autumn.

C. graminifòlia, from Delaware S.: silvery-silky, with long lance-linear and grass-like shining nerved leaves, and single or few heads. ♃

C. falcàta, on the coast, from Cape Cod to New Jersey: only 4′ – 10′ high, woolly, clothed to the top with short and linear 3-nerved rigid leaves, which are often curved or scythe-shaped (whence the specific name); heads small, corymbed. ♃

C. gossýpina, from Virginia S.: white-cottony all over (whence the name), with oblong obtuse rarely toothed leaves, and few pretty large heads. ♃

C. Marìàna, the commonest species, from Long Island S.: silky with long and weak hairs, or smoothish when old, with oblong leaves, and a few corymbed heads on glandular peduncles. ♃

C. villòsa, from Wisconsin S. & W.: coarsely hairy and somewhat hoary, leafy to the top, with corymbed branches bearing single heads on short peduncles, and narrow-oblong leaves. ♃

34. SOLIDÀGO, GOLDEN-ROD. (Old name, from Latin word *to make whole*, from supposed healing qualities.) There are very many species, flowering through late summer and autumn. See Manual and Chapman's S. Flora. The following are a few of the very commonest. ♃

§ 1. *Heads clustered in the axils of the feather-veined leaves.*

S. bícolor. Pale and downy or hairy, with oblong or lance-oblong scarcely toothed leaves, and small heads with cream-colored or nearly white ray-flowers!

S. latifòlia, of shaded banks N.: smooth, with broadly ovate pointed and sharply serrate thin leaves, and bright yellow ray-flowers.

S. cæsia is like the last, but with more branched and glaucous stems, and lanceolate or lance-oblong sessile leaves.

§ 2. *Heads in racemes forming a terminal panicle.*

* *Leaves feather-veined, not 3-ribbed.*

S. argùta. Smooth, with the lowest and root-leaves oblong or lance-oval pointed and sharply toothed, the upper narrower and entire; the slender one-sided naked racemes widely spreading or drooping.

S. altíssima, badly named, as it is mostly only 2° – 4° high, one of the earliest-flowering Golden-rods, with rough-hairy stem, small lance-ovate or oblong and serrate very veiny leaves, and one-sided recurving racemes of small heads of bright-yellow flowers.

* * *Leaves feather-veined and indistinctly triple-ribbed, entire or nearly so, grayish.*

S. nemoràlis, in dry open ground, flowering soon after midsummer, only 1° – 2° high, pale with very minute down; the leaves spatulate-oblong or oblanceolate; one-sided dense racemes numerous and at length recurving, and flowers bright golden-yellow.

* * * *Leaves plainly either 3-ribbed or triple-ribbed: racemes one-sided, crowded, spreading or recurving and forming an ample panicle.*

S. Canadénsis, has rough-hairy stems, lanceolate and usually serrate pointed leaves rather downy beneath but rough above, and small heads with short rays.

S. gigantèa is smooth or smoothish, especially the stem, and with larger heads and rays than the preceding.

§ 3. *Heads much crowded in a terminal compound corymb.*

S. rígida, in dry soil, a tall and stout species, minutely hoary-downy and roughish, the thick oval or oblong leaves with a strong midrib; the remarkably large heads as many as 30-flowered.

S. lanceolàta, along river-banks, only 2° – 3° high, very bushy-branched, nearly smooth, with lance-linear 3 – 5-nerved leaves, and dense flat corymbs of small heads sessile in clusters, the small rays 15 – 20, the disk-flowers fewer.

S. tenuifòlia, in sandy ground, usually near the coast; like the preceding, but more slender, with narrow linear mostly 1-nerved dotted leaves, and narrower or club-shaped heads, the small rays 6 – 12.

35. CALLÍSTEPHUS, CHINA-ASTER. (Name from Greek words meaning *beautiful crown.*) Fl. all summer. ①

C. Chinénsis, the well-known CHINA-ASTER, of the gardens, a native of China and Japan, has numerous varieties of various colors, the finest full-double.

36. ÁSTER, STARWORT, ASTER. (Name, *aster*, a star.) This vast genus (with which SERICOCÁRPUS and DIPLOPÁPPUS may be here included) is too difficult for beginners, and those who are prepared for their study will naturally use the Manual for the northern species, and Chapman's Southern Flora for the few that are peculiarly southern. We barely mention the commonest and more distinct or striking of our 40 or 50 wild species. Fl. late summer and autumn. ♃

§ 1. *With heart-shaped and petioled leaves, at least the lower ones.*

* *Heads in open corymbs, middle-sized: rays white or nearly so and rather few. In woodlands, rather early-flowering.*

A. corymbòsus, CORYMBED ASTER. Rather slender, with thin coarsely-toothed and sharp-pointed leaves, which are considerably longer than broad, and only 6 – 9 rays.

A. macrophýllus, LARGE-LEAVED A. Larger and stouter, 2° – 3° high, with broader and thickish rather rough leaves, and more rigid corymbs of larger heads, with 12 – 24 rays.

* * *Heads panicled, numerous and small. In woodlands, &c.*

A. cordifòlius, HEART-LEAVED A., is smooth or smoothish, much branched, with thinnish serrate leaves on slender petioles, and very numerous loosely panicled small heads, the rays pale blue or whitish.

A. undulàtus, WAVY-LEAVED A., is minutely downy, with the leaves only slightly toothed or wavy, the lowest heart-shaped and on margined petioles, the upper abruptly contracted into short and broadly winged petioles with dilated and clasping base, or else sessile by a heart-shaped base; the heads larger and in narrow or raceme-like panicles, and with rather showy purple-blue rays.

§ 2. *With lower leaves never heart-shaped, the upper ones sessile and partly clasping by a heart-shaped or auricled base: heads large or rather large, showy, the numerous rays purple or blue.*

* *Scales of the involucre not at all leafy, but with short greenish tips, rigid, close-pressed in many ranks, the outer successively shorter: rays deep-colored: leaves entire or nearly so. Dry grounds.*

A. pàtens, SPREADING A. Rough with short hairiness, 1° – 3° high, with long widely spreading branches, and single large heads terminating the slender minutely-leaved branchlets; all the stem-leaves clasping, usually lance-oblong or lance-ovate, the larger ones often contracted above the heart-shaped base, rough-edged; rays deep purple-violet.

A. lævis, SMOOTH A. Well-known by its perfect smoothness, pale, often glaucous, with lanceolate or lance-ovate leaves, heads middle-sized in a rather close panicle, involucre of close-pressed whitish scales with abrupt green tips, and rays sky-blue.

* * *Scales of the involucre not leafy but loose and slender, all of about the same length, clammy-glandular, leaves entire.*

A. Novæ-Ángliæ, New England A., but everywhere common in low grounds; the stout hairy stem 4° – 8° high, thickly beset to the top with lanceolate minutely downy leaves, which all have an auricled clasping base; heads many and large in a crowded corymb; the rays very numerous and narrow, violet-purple, or in var. róseus rose-purple or reddish.

* * * *Scales of the involucre about equal in length, loose and with more or less leaf-like spreading tips, or the outermost wholly green: leaves serrate in the middle or sometimes nearly entire: heads loosely corymbed or panicled. Low grounds.*

A. prenanthoides. In rich woodlands chiefly N. & W.; only 1° – 2° high, almost smooth, with lance-ovate leaves coarsely toothed in the middle, tapering above into a long point, and below into a portion narrower than the abruptly dilated heart-shaped clasping base; rays pale blue.

A. puníceus, Red-stemmed A. In wet grounds, mostly 3° – 6° high, loosely branched, rough-hairy, commonly purple-tinged, with lance-oblong or lanceolate sparingly serrate rough leaves, the base auricled and partly clasping; scales of involucre slender; rays long, bright or pale blue.

A. longifòlius, Long-leaved A. Smooth or nearly so, 1° – 4° high, with lanceolate or linear often entire taper-pointed rather firm and glossy leaves, more leaf-like scales to the involucre, and bright blue-purple rays.

§ 3. *With leaves none of them heart-shaped, those of the stem all sessile: heads very small and numerous, racemed or panicled: involucre imbricated in few or several rows: the scales with green tips, the outer successively shorter.*

* *In dry open ground, about 1° high: rays white: scales of the involucre rigid and whitish, with abrupt and spreading conspicuous green tips.*

A. ericoides, Heath-like A. Smooth or rather hairy, with lanceolate or linear-awl-shaped leaves acute at both ends, and scales of the involucre broadest at base, the green tips acute.

A. multiflòrus, Many-flowered A. Very common in sterile dry soil, pale or slightly hoary with fine close down, much branched and bush-like, with spreading linear leaves rough or ciliate on their margins, the upper sessile or partly clasping by a broad base; scales of involucre spatulate, the green tip shorter than the whitish lower portion.

* * *In low, moist, or shady places, 1° – 3° high: scales of involucre with short and close-pressed green or greenish tips.*

A. Tradescánti. Nearly smooth, with slender stems, linear or lance-linear leaves, and very small and numerous heads closely racemed along the upper side of the flowering branches, the scales of the involucre narrow linear and acute; rays white.

A. miser. Rather hairy, with lanceolate or lance-oblong thin leaves tapering to each end and sharply toothed about the middle, heads loosely racemed or scattered on diverging branches, and with linear rather blunt scales of the involucre; rays pale blue-purple or white.

A. dumòsus, Bushy A. Smooth or almost so, loosely bushy-branched, with mostly linear entire or slightly serrate rough-edged leaves, and loosely racemed flowering branchlets bearing solitary or few heads; scales of the involucre linear-spatulate and blunt, closely imbricated in several rows; rays usually light purple-blue, sometimes nearly white.

§ 4. *With small and very rigid linear sessile leaves, a large head solitary at the end of the simple stem or few branches, the involucre of narrow rigid scales closely imbricated in very many rows, without green tips, and showy violet-blue rays.*

A. linariifòlius, of the older botanists, strictly Diplopáppus linariifòlius (having a double pappus, the outer of very short bristles); common in open gravelly or sandy ground, 6′ – 20′ high; the spreading leaves with rough margins, strong midrib, and no veins.

37. ERÍGERON, FLEABANE. (Name of Greek words, for *spring* and *old man*, suggested probably by the hoary appearance of some vernal species.) ERIGERON SPECIÒSUM of Oregon is occasionally cultivated as a garden perennial, is more showy than any of the following, which are the common wild species of the country.

§ 1. *Rays conspicuous: heads more or less corymbed: stem erect.*

* *Rays purple or purplish, very numerous (50 – 150): pappus simple.* ♃

E. Philadélphicum, COMMON F. Low grounds: 2° high, rather hairy, with oblong mostly entire and partly clasping stem-leaves, spatulate and toothed root-leaves, and several heads; the rays very many and narrow, pale reddish-purple: fl. summer.

E. bellidifòlium, DAISY-LEAVED F. or ROBIN'S PLANTAIN. Moist ground, soft-hairy, 1° - 2° high, with a cluster of rather large roundish root-leaves lying flat on the ground, the stem-leaves rather few and small; heads 1 – 9 and long peduncled, rather large, with about 50 linear light bluish-purple rays: fl. late spring.

* * *Rays white, only about 30, rather broad: pappus simple.* ♃

E. vérnum. Low grounds from Virginia S.; smooth, with oval or spatulate leaves all at the root, slender scape 1° - 2° high, with a few small heads: fl. spring.

* * * *Rays white or nearly so, 50 or more, narrow: pappus double, the outer of a row of minute chaffy bristles or little scales.* ① ②

E. strigòsum, SMALLER DAISY-FLEABANE. Fields: 2° – 4° high, smoothish, or roughish with minute close-pressed hairs; leaves entire, the lower spatulate and slender-petioled, the upper lanceolate; rays pretty long: fl. all summer.

E. ánnuum, LARGER DAISY-FLEABANE. Fields and waste places; a common weed, 3° – 5° high, branched above, roughish with spreading hairs; leaves ovate or lance-ovate, the lower ones coarsely toothed; rays rather short, often tinged with purple: fl. all summer.

§ 2. *Rays inconspicuous, scarcely longer than the cylindrical bell-shaped involucre and the simple pappus, numerous, in more than one row.*

E. Canadénse, HORSEWEED or BUTTERWEED. A common weed in waste or cult. ground, bristly hairy; with erect strict stem 1° – 5° high, linear leaves, only the lowest ones cut-lobed, and very small panicled heads of whitish flowers, all summer. ①

38. BOLTÒNIA. (Named for *J. Bolton*, an English botanist.) Wild plants of low grounds S. & W., resembling Asters except in the akenes and pappus: ray-flowers blue-purple or nearly white; disk-flowers yellow; in autumn. ♃

B. diffùsa, of Illinois & S., has small heads loosely panicled on the slender open branches, which bear small awl-shaped leaves, those of the stem lance-linear; *pappus of several bristles and 2 short awns.*

B. glastifòlia, from Penn. S. & W., has fewer larger and corymbed heads, lanceolate partly erect leaves, broadly winged akenes, and 2 or 3 short awns in the pappus.

B. asteroìdes, from Penn. S., less common, is very like the last, but with narrow margins to the akenes and no awns (only a few short bristles) in the pappus.

39. BRACHÝCOME. (Name in Greek means *short tuft*, from the pappus, in which respect mainly it differs from the Daisy-genus.)

B. iberidifòlia, cult. for ornament, from Australia, has slender branching stems nearly 1° high, pinnately parted leaves with very slender divisions, and handsome heads with violet-blue ray-flowers and similar or darker purple centre, produced all summer. ①

40. BÉLLIS, DAISY. (The old Latin name of the Daisy, from *bellus*, pretty.) (Fl. spring and summer.)

B. integrifòlia, Western Wild Daisy: in open grounds from Kentucky S. W., has branching spreading stems 4′ – 10′ long, bearing some lanceolate-oblong or spatulate leaves, and terminal slender-peduncled heads with pale blue-purple rays. ① ②

B. perénnis, True or English Daisy, cult. from Eu., mostly in double-flowered varieties, i. e. with many or all the disk-flowers changed into rays, or, in the common *quilled* form, all into tubes (pink or white): in the natural state the centre is yellow, the rays white and more or less purplish or crimson-tipped underneath; head solitary on a short scape; leaves spatulate or obovate, all clustered at the root. ♃

41. ACHILLÈA, YARROW, SNEEZEWORT. (Named after *Achilles*.) Leafy-stemmed, with small heads in corymbs. ♃

A. Millefòlium, Common Y. or Milfoil, abounds over fields and hills, 10′ – 20′ high, with leaves twice pinnately parted into very slender and crowded linear 3 – 5-cleft divisions, heads crowded in a close flat corymb, with 4 or 5 short rays, white, sometimes rose-colored: all summer.

A. Ptármica, Sneezewort. Run wild from Eu. in a few places, cult. in gardens, especially a full-double variety, which is pretty, fl. in autumn; leaves simple, lance-linear, sharply cut-serrate; heads in a loose corymb, with 8 – 12 or more rather long bright white rays.

42. MARÙTA, MAYWEED. (Meaning of the name uncertain.) Native of the Old World.

M. Cótula, or Anthemis Cotula, the Common Mayweed, along roadsides, especially E.; low, strong-scented and acrid, with leaves thrice pinnately divided into slender leaflets or lobes, rather small heads terminating the branches, with white rays and yellow centre; all late summer. ①

43. ÁNTHEMIS, CHAMOMILE. (Ancient Greek name, from the profusion of flowers.) Natives of Old World: fl. summer. Peduncles bearing solitary or very few heads.

A. arvénsis, Field C. Resembles Mayweed and grows in similar places, but rare, is not unpleasantly scented, has fertile rays and a minute border of pappus. ① ②

A. nóbilis, Garden C., yields the Chamomile-flowers of the apothecaries, spreads over the ground, very finely divided foliage pleasantly strong-scented; rays white; pappus none. ♃

A. tinctòria, Yellow C., is cult. for ornament, but hardly common: 2° – 3° high, with pinnately divided and again pinnatifid or cut-toothed leaves, and heads as large as those of Whiteweed, with golden-yellow flowers, or the rays sometimes white. ♃

44. CHRYSÁNTHEMUM, including Leucánthemum and Pyrèthrum. (Name means *golden flowers* in Greek; but they are of various colors.) All natives of Old World.

§ 1. Leucánthemum or Whiteweed and Feverfew: *the ray-flowers white, those of the centre mostly yellow.* ♃

C. Leucánthemum, or Leucánthemum vulgàre, the too common Whiteweed or Ox-eye Daisy, filling meadows and pastures, and difficult to eradicate; has stems nearly simple and erect from the creeping base or rootstock, bearing cut-toothed or slightly pinnatifid leaves below (the lowest spatulate, upper partly clasping), the naked summit bearing the single showy head, in early summer. ♃

C. (or **L.**) **Parthènium,** or Pyrèthrum Parthenium, Feverfew. Cult. in old gardens, and running wild; with branching leafy stems 1° – 3°

high, leaves twice pinnately divided into rather coarse ovate leaflets, and loose corymbs of rather small heads, in summer. A double-flowered variety has the disk-corollas transformed into white or whitish tubes.

C. parthenioides, DOUBLE-FL. or PARSLEY-LEAVED FEVERFEW, from China; probably a low, finer-leaved, and much altered full double variety of the foregoing, with pure white flowers all in the form of rays, produced through the summer and autumn.

§ 2. CHRYSANTHEMUMS *of the gardens: the flowers of various colors, but only in certain varieties white.*

C. ròseum, from Persia and N. Asia, with simple stems bearing once or twice pinnately divided smooth leaves with linear divisions, and at the naked *summit single* heads as large as those of Whiteweed, but with pale rose or bright pink-red rays (and in some varieties full double), is coming into ornamental cultivation: the pulverized flower-heads form the well-known Persian Insect powder: fl. summer. ♃

C. Índicum, parent of the CHINESE CHRYSANTHEMUMS, flowering in late autumn, of numerous forms and colors, mostly full-double, &c. from China and Japan. ♃

C. coronàrium, SUMMER CHRYSANTHEMUM, with yellow or sometimes whitish flowers, cult. from N. Africa; smooth, with branching stems, twice pinnately parted leaves with auricled and clasping base, and lanceolate or linear cut-toothed divisions; the involucre of broad and scarious scales. ①

45. HELÈNIUM, SNEEZEWEED. (The old Greek name of some very different plant named after *Helen.*) North American herbs.

H. autumnàle, the commonest species, wild in low grounds, 1°–4° high, with lanceolate toothed leaves, their base often decurrent on the stem, and a corymb of showy yellow-flowered heads, the rays often drooping, in autumn. ♃

46. GAILLÁRDIA. (Named for *Gaillard*, a French amateur of botany.) North American low or spreading herbs: fl. all summer.

G. lanceolàta, wild from Carolina S. in pine barrens, has narrow mostly entire lanceolate leaves, commonly small and few yellow rays, and purple disk-flowers. ② ♃

G. pulchélla, wild from Louisiana W. and cult. for ornament (one form called G. PICTA), has broader leaves, some of them cut-toothed or lobed, and showy heads with the large rays mostly brownish crimson-purple with yellow tips. ①

G. aristàta, wild from Missouri W., and cult., is more downy than the last, less branched, with large showy rays yellow throughout, or their base brown-purple. ♃

47. GAZÁNIA. (Named for a learned ecclesiastic of the middle ages, *Theodore de Gaza.*) South African plants of the conservatory, and flowering all summer when bedded out.

G. rìgens, also named SPLÉNDENS, of Cape of Good Hope, with short stems spreading on the ground, bearing spatulate entire or some pinnatifid leaves, which are nearly smooth and green above, but very silvery with white cotton underneath, and a large showy head, the orange rays over 1′ long, and with a dark eye-spot at base. ♃

48. CALÉNDULA, MARIGOLD. (Name from the Latin *calendæ* or *calends;* flowering through the months.)

C. officinàlis, GARDEN MARIGOLD, of the Old World; cult. in country gardens, 1° high, spreading, with green and succulent oblong and entire sessile leaves, rather unpleasantly scented, and large head of yellow flowers, produced all summer, sometimes nearly full-double, most of the corollas being strap-shaped. ①

49. POLYMNIA, LEAF-CUP. (These coarse and inelegant plants are oddly dedicated to one of the Muses.) Fl. summer and autumn. ♃

P. Canadénsis, common in shaded ravines N., is 3° – 5° high, clammy-hairy, with thin leaves, the lower pinnatifid, the upper 3 – 5-lobed or angled, and the few pale-yellow and broad rays of the small heads shorter than the involucre.

P. Uvedàlia, in rich soil from New York to Ill. and S., is roughish-hairy, stout, 4° – 10° high, with large ovate and angled or lobed leaves, the upper ones sessile, and rays of the pretty large head 10 – 15, bright yellow, longer than the involucre.

50. SÍLPHIUM, ROSIN-PLANT. (Ancient Greek name of some very different plant.) Fl. summer and autumn. ♃

§ 1. *Leaves alternate, large, most of them petioled.*

* *The stout and rough flowering stems (3° – 6° high) leafy up to the few large heads: scales of involucre ovate, with tapering and spreading rigid tips.*

S. laciniàtum, ROSIN-WEED or COMPASS-PLANT, of prairies, from Michigan W. & S., so called because the rough-hairy deeply pinnatifid root-leaves (of ovate outline) incline to present their edges N. & S.

* * *The slender smooth flowering stems (4° – 10° high) leafy only near the base, dividing above into a panicle of many smaller heads.*

S. terebinthinàceum, PRAIRIE-DOCK, so called from the appearance of the large root-leaves, which are ovate or heart-oblong and 1° – 2° long, besides the slender petiole, the margins somewhat toothed: common W.

S. compósitum, from North Carolina S., is more slender and smaller, with round heart-shaped leaves either toothed or cut, or divided.

§ 2. *Leaves or many of them in whorls of 3 or 4 along the terete stems, rather small, entire or coarsely toothed.*

S. trifoliàtum, of S. & W., has the smooth stem 4° – 6° high, lanceolate roughish leaves, and small heads.

S. Asteriscus, of dry soil S., is rough-hairy, with fewer and larger heads.

§ 3. *Leaves opposite and clasping or connate: stems leafy to the top.*

S. integrifòlium, in prairies from Michigan W. & S.; roughish, 2° – 4° high, with lance-ovate partly heart-shaped and entire distinct leaves.

S. perfoliàtum, CUP-PLANT, of rich soil W. & S.: with very smooth square stems 4° – 9° high, around which the ovate coarsely toothed leaves are connate into cup which holds water from the rains.

51. DÁHLIA. (Named for a Swedish professor, *Dahl*, contemporary with Linnæus.) ♃ Two or three Mexican species, of which the most familiar is

D. variábilis, COMMON DAHLIA of the gardens, with pinnate leaves, ovate serrate leaflets, and large heads, much increased in size and altered, of all colors: roots fascicled and tuberous (Lessons, p. 32, fig. 60).

52. COREÓPSIS, TICKSEED. (Named from Greek word for *bug*, from the shape of the akenes.) Many wild species: several cult. for ornament: these are the commonest. Fl. summer. (See Lessons, p. 106, 107, fig. 219, 220.)

§ 1. *Rays broad, coarsely 3 – 5-toothed: outer involucre not longer than the inner: akenes orbicular or oval, incurved when mature. Chiefly cultivated.*

① ② *Disk-flowers and lower part of the rays dark-colored or brown-purple: akenes in these species wingless and nearly naked at top; leaves compound.*

C. tinctòria, of Arkansas, &c., the commonest COREOPSIS or CALLIOPSIS of all country gardens; smooth, with lower leaves twice-pinnately divided into narrow leaflets, numerous heads, and lower half or sometimes almost the whole of rays brown-purple: in one variety they are changed to tubes.

C. Drummóndii, of Texas, is low and spreading, rather hairy, with leaves of 3 – 7 oval leaflets, or some of them simple, heads on long peduncles, and very broad rays golden yellow with small dark spot at base.

* * ① *Disk-flowers yellow: rays yellow with a darker and purplish-streaked spot near the base: akenes winged and 2-toothed.*

C. coronàta, of Texas, is low, with slender-petioled leaves oblong or spatulate, or some of them 3 – 5-parted, and very long peduncle; rays broad and handsome.

* * * ♃ *Disk-flowers and rays (1′ long) entirely yellow; akenes orbicular, much incurved and broadly winged when ripe, crowned with 2 little teeth or scales.*

C. lanceolàta. Wild W. & S., and cult. in gardens; 1° – 2° high, smooth or sometimes downy, in tufts, with lanceolate or oblanceolate entire leaves mostly crowded at the base, and long slender peduncles: flowers in early summer.

C. auriculàta. Wild W. & S., and in some gardens; taller, sometimes with runners or suckers at base, leafy to near the top; upper leaves oblong, lower roundish and sometimes auricled at base or with 3 – 5 lobes or leaflets.

§ 2. *Rays entire or nearly so, oblong or lanceolate: akenes oblong, with a very narrow wing or border, not incurved, and obscurely if at all 2-toothed at the apex: scales of outer involucre narrow and entire: heads rather small, the flowers all yellow.* ♃

* *Low, 1° – 3° high, leafy to the top: leaves really opposite and sessile, but divided into 3 leaflets, thus seeming to be 6 in a whorl. Wild chiefly in S. States, all but the first are cult in gardens.*

C. senifòlia, has seemingly 6 lance-ovate and entire leaflets in a whorl, (i. e. two, but each 3-divided) smooth or downy.

C. verticillàta, has the pair cut into once or twice pinnate almost thread-shaped divisions, smooth.

C. delphinifòlia, very like the last, but with fewer lance-linear divisions.

* * *Tall, leafy to the top, with evidently opposite petioled leaves.*

C. trípteris. Rich ground W. & S., with simple stems 4° – 9° high, leaves of 3 – 5 lanceolate entire leaflets, corymbed heads, very short outer-involucre, and blunt rays.

§ 3. *Rays oval or oblong, golden yellow, slightly notched: akenes wingless, not incurved, bearing 2 awns or teeth for a pappus: outer involucre conspicuous and resembling leaves: branching plants of wet grounds, with thin leaves mostly of 3 – 7 pinnate toothed or cut veiny leaflets; resembling the next genus, but the awns not downwardly barbed.* ① ②

C. trichospérma. Swamps mostly near the coast, 1° – 2° high, with 3 – 7 lanceolate or linear cut-toothed leaflets or divisions, numerous heads, and narrow-oblong or linear wedge-shaped marginless akenes with 2 stout teeth.

C. aùrea, only S., has upper leaves often simple, lower nearly as in the foregoing, and shorter wedge-obovate akenes with 2 or 4 short chaff-like teeth.

C. aristòsa, from Illinois S., has more compound leaves with oblong or lanceolate often pinnatifid leaflets, and broad-obovate very flat akenes slightly margined and bristly ciliate, the pappus of 2 long and slender awns, or sometimes 3 or 4, or in one variety none at all.

53. BÌDENS, BUR-MARIGOLD, BEGGAR-TICKS. (Latin for two-toothed, from the usually 2 awns of the pappus.) Our species ① or ②; fl. summer and autumn. The akenes adhering to the dress or to the fleece of animals by their barbed awns.

§ 1. *Akenes broad and flat, with bristly ciliate margins.*

* *Coarse and very homely weeds, commonly without any rays.*

B. frondòsa, COMMON BEGGAR-TICKS. Coarse weed in low or manured grounds, 2° – 6° high, branched, with pinnate leaves of 3 – 5 broad lanceolate

coarsely toothed leaflets, outer involucre much longer than the head, and wedge-obovate akenes ciliate with upturned bristles, and 2-awned.

B. connàta, Swamp B. Low grounds; smooth, 1° – 2° high, with simple lanceolate and taper-pointed leaves, or the lower 3-divided and decurrent on the petiole, smaller heads, narrow wedge-shaped akenes minutely and downwardly ciliate and bearing about 3 awns.

* * *Low smooth herbs, with showy golden yellow rays 1′ long.*

B. chrysanthemoides, Larger Bur-Marigold. Shallow water or wet places, 6′ – 30′ high, with simple lanceolate sessile serrate leaves, outer involucre shorter than the rays, and wedge-shaped akenes with almost prickly downwardly barbed margins and 2 – 4 awns.

§ 2. *Akenes linear or needle-shaped.*

B. Béckii, Water B. Immersed in water, N. and W., the single short-peduncled heads rising above the surface, and with showy rays; leaves cut into very numerous fine hair-like divisions; awns of the stout akenes 4 – 6, barbed near the tip.

B. bipinnàta. Dry soil, from Conn. to Ill. and S., 1° – 3° high, branched, with 1 – 3-pinnately parted petioled leaves, ovate-lanceolate leaflets, small heads, short pale-yellow rays, and slender akenes with 3 – 4 barbed awns.

54. ACTINÓMERIS. (Greek-made name, alluding to the irregularity of the rays in the commonest species.) ♃

A. squarròsa, common in low rich soil from W. New York S. & W.; with branching stems 4° – 8° high, lance-oblong leaves tapering to both ends, numerous rather corymbed heads, spreading involucre, 4 – 10 irregular rays, and broadly winged akenes: fl. Sept.

A. helianthoìdes, in open grounds W. & S., resembles a Sunflower as the name denotes, 1° – 3° high, with more hairy lance-ovate sessile leaves, few and larger heads, erect involucre, 8 – 15 regular rays, and slightly winged akenes: fl. summer.

55. VERBESÌNA, CROWNBEARD. (Origin of name obscure.) Ours are tall (4° – 7° high) branching herbs in rich soil, with compound corymbs of small heads: fl. summer. ♃

V. Siegesbéckia, from S. Penn. to Ill. & S., has 4-winged stems, smoothish, large and thin ovate and opposite leaves pointed at both ends, yellow flowers, and wingless akenes.

V. Virgínica, of same range, has stem, less winged, smaller lance-ovate alternate leaves soft-downy beneath, white flowers, and narrowly winged akenes.

56. XIMINÈSIA. (Named for *J. Ximines*, a Spanish apothecary.)

X. encelioìdes, of Texas and Mexico, and cult. for ornament, 2° high, spreading, rather hoary, at least the lower face of the oblong or heart-shaped clasping serrate leaves; the bright yellow heads somewhat corymbed, showy, the rays deeply 3-toothed: fl. all summer. ①

57. HELIÁNTHUS, SUNFLOWER (which the name means in Greek). The following are the commonest of the numerous species, many of which are difficult.

§ 1. ① *Receptacle flat and very broad: disk brownish: leaves alternate, broad and triple-ribbed, petioled: fl. summer. Cult. for ornament: wild only far S. W.: fl. all summer.*

H. ánnuus, the Great Common Sunflower of the gardens, with huge heads; leaves green, roughish, not hoary.

H. argophýllus, of Texas, cult. for its hoary-white foliage; heads smaller.

§ 2. ♃ *Receptacle and disk convex: heads middle-sized or rather small: flowering throughout late summer and autumn.*

** Disk dark purple, contrasting with the yellow rays.*

+ Leaves long and linear, 1-nerved, entire, sessile: heads small and mostly corymbed: involucre of leaf-like spreading scales.

H. angustifòlius, of pine-barrens from New Jersey S., has slender rough stems 2° - 6° high, lower leaves opposite and rough.

H. orgyàlis, of Kansas and Arkansas, cult., has stems (6° - 10° high), and crowded very narrow alternate leaves smooth: fl. late.

+ + Leaves oval or lanceolate, opposite: stems 1° - 3° high, bearing solitary or few long-peduncled rather large heads: involucre of short close scales.

H. heterophýllus, of low pine-barrens S.; rather hairy, with lowest leaves oval or oblong, upper ones lance-linear and few; scales of involucre lanceolate.

H. rígidus, of dry prairies W. & S.; rough, with thick firm leaves lance-oblong or the lower oval; scales of the involucre ovate or oblong, blunt.

** * Disk yellow as well as the rays, or hardly dingy-brownish.*

+ Scales of the involucre short and broadly lanceolate, regularly imbricated, without leaf-like tips: leaves nearly all opposite and nearly entire.

H. occidentàlis, of dry barrens from Ohio W. & S.: somewhat hairy, with slender simple stems 1° - 3° high, sending off runners from base, naked above, bearing 1 - 5 heads; lowest leaves ovate or lance-ovate; upper ones narrow, small and distant.

H. móllis, of same situations, is soft white-woolly all over, 2° - 4° high, leafy to the top, the leaves heart-ovate and partly clasping.

+ + Scales of the involucre looser and leafy-tipped: stems leafy to the top.

++ Leaves chiefly alternate and not triple-ribbed.

H. gigantèus, common in low grounds N.; rough and rather hairy, 3° - 10° high, with lanceolate serrate nearly sessile leaves, and pale yellow rays.

++ ++ Leaves mainly opposite, except in the last, 3-ribbed at base or triple-ribbed.

H. divaricàtus, common in dry sterile soil, has smooth stem 1° - 3° high, rough ovate-lanceolate leaves tapering to a point and 3-nerved at the rounded sessile base.

H. hirsùtus, only W., differs from the preceding in its rough-hairy stem 1° - 2° high, and leaves with narrower base more or less petioled.

H. strumòsus, common in low grounds, has mostly smooth stems 3° - 4° high, broadly lanceolate or lance-ovate leaves rough above and whitish or white-downy beneath, their margins beset with fine appressed teeth, and petioles short and margined.

H. decapétalus, so named because (like the preceding) it commonly has 10 rays; common along streams, has branching stems 3° - 5° high, thin and bright-green smoothish ovate leaves coarsely toothed and abruptly contracted into margined petioles; scales of the involucre long and loose.

H. tuberòsus, Jerusalem Artichoke (i. e. *Girasole* or Sunflower in Italian, corrupted in England into *Jerusalem*): cult. for the tubers and run wild in fence-rows, probably a state of a wild S. W. species; 5° - 7° high, with triple-ribbed ovate petioled leaves, rough-hairy as well as the stems, all the upper ones alternate, the running rootstocks ending in ovate or oblong edible tubers.

58. HELIÓPSIS, OX-EYE. (Greek-made name, from the likeness to Sunflower.)

H. lævis, our only species, common in rich or low grounds, resembles a Sunflower of the last section, but has pistillate rays and 4-sided akenes without pappus: 1° - 4° high, smooth; leaves ovate or lance-ovate, triple-ribbed, petioled, serrate; head of golden-yellow flowers terminating the branches, in summer.

59. RUDBÉCKIA, CONE-FLOWER. (Named for *Rudbeck*, father and son, Swedish botanists.) The following are the commonest species, all natives of this country: fl. summer.

§ 1. *Disk broadly conical, dark-colored, the soft chaff not pointed: rough-hairy plants 1° – 2° high, leafy below, the naked summit of the stems or branches bearing single showy heads: leaves simple.* ♃

R. speciòsa, from Penn. W. & S., and cult. in some gardens; leaves lanceolate or ovate-lanceolate, pointed at both ends, 3 – 5-nerved, petioled, coarsely toothed or cut.

R. hírta, common in open ground W. & S., introduced into meadows E. with clover-seed; stems stout and mostly simple; leaves nearly entire, triple-ribbed, oblong-lanceolate or the lowest spatulate, the upper sessile.

§ 2. *Disk conical, dark-purple, the chaff awn-pointed: lower leaves often pinnately parted or 3-cleft.* ②

R. tríloba, from Penn. to Ill. & S.; hairy, 2° – 5° high, much branched, with upper leaves lance-ovate and toothed, and the numerous small heads with only about 8 rays.

§ 3. *Disk globular, pale dull brownish (receptacle sweet-scented), the chaff blunt and downy at the end; lower leaves 3-parted.* ♃

R. subtomentòsa, of the prairies and plains W.; somewhat downy, with leafy stems 3° – 5° high, ovate or lance-ovate serrate upper leaves and short-peduncled heads.

§ 4. *Disk oblong, or in fruit cylindrical and 1′ long, greenish yellow, the chaff very blunt and downy at the end: leaves all compound or cleft.* ♃

R. laciniàta, COMMON CONE-FLOWER, in low thickets; 3° – 7° high, smooth, branching above; lowest leaves pinnate with 5 – 7 cut or cleft leaflets, upper ones 3 – 5-parted, or the uppermost undivided; heads long-peduncled, with linear drooping rays 1′ – 2′ long.

60. LÉPACHYS. (Supposed to be formed from Greek words for *thick* and *scale*.) Receptacle anise-scented when crushed. Fl. summer.

L. pinnàta, in dry soil from W. New York W. & S.: minutely roughish and slightly hoary; the slender leafy stems 3° – 5° high, bearing leaves of 3 – 7 lanceolate leaflets, and somewhat corymbed heads with the oval or oblong disk much shorter than the oblong drooping yellow rays; akenes scarcely 2-toothed, flattish, the inner edge hardly wing-margined. ♃

L. columnàris, of the plains W. of the Mississippi; cult. for ornament; 1° – 2° high, with single or few long-peduncled heads, their cylindrical disk often becoming 2′ long, and longer than the 5 – 8 broad drooping rays, these either yellow, or var. PULCHÉRRIMA, with the base or lower half brown-purple; akenes 1 – 2-toothed at top and winged down one edge. ♃

61. DRACÒPIS. (Name refers in some obscure way to a *Dragon*.) ①

D. amplexicaùlis, wild far S. W., sometimes cult. for ornament; smooth, 1° – 2° high, with clasping heart-shaped pale leaves, and long-peduncled heads, like those of the preceding, the broad rays mostly shorter than the cylindrical disk, and either yellow or the lower part brown-purple.

62. ECHINÀCEA, HEDGEHOG CONE-FLOWER. (Name means like a *hedgehog*, viz. receptacle with prickly pointed chaff.) Fl. summer. ♃

E. purpùrea, in prairies and open grounds from W. Penn. W. & S.: stems 1° – 2° high from a thick and black pungent-tasted root (called *Black Sampson* by quack-doctors), bearing ovate or lanceolate 5-nerved and veiny leaves, the lower long-petioled, and terminated by a large head; rays 15 – 20, dull rose-purple.

E. angustifòlia, from Wisconsin S., is a more slender form, with narrow lanceolate 3-nerved entire leaves, and 12 – 15 brighter-colored rays.

63. ZÍNNIA. (Named for a German professor, *Zinn.*) Commonly cultivated for ornament: fl. all summer.

Z. élegans, the favorite GARDEN ZINNIA, from Mexico, with ovate heart-shaped half-clasping leaves, and very large heads of rose-colored, purple, violet, red, or white flowers, 2′–3′ in diameter, of late also full-double like a small Dahlia; chaff of receptacle crested-toothed at tip; akenes barely 2-toothed at summit. ①

Z. multiflòra, from Mexico, &c., now not common in gardens, being less showy, has ovate-lanceolate leaves, hollow peduncle much enlarged under the head, obovate red-purple rays, blunt entire chaff, and 1-awned akenes. ①

Z. angustifòlia, cult. as Z. AÙREA, from Mexico, is widely and copiously branched, rough-hairy, with lanceolate leaves, many small heads, oval orange-yellow rays, and conspicuously pointed chaff.

64. TAGÈTES, FRENCH or AFRICAN MARIGOLD, but from South America and Mexico. (Mythological name.) Fl. all summer. ①

* *Plant anise-scented, with entire leaves, small corymbed heads, and few rays.*

T. lùcida, now rather uncommon in gardens, has glossy lanceolate serrate leaves, and orange flowers.

* * *Plant strong-scented: leaves pinnate: leaflets cut-toothed: head large.*

T. erécta, LARGE AFRICAN M., with lanceolate leaflets, inflated club-shaped peduncles, and heads of orange or lemon-colored flowers, often full double.

T. pátula, FRENCH M., with finer lance-linear leaflets, cylindrical peduncles, and narrower heads, the rays orange or with darker stripes.

T. signàta is a more delicate low much-branched species, with finely cut leaves, slender peduncles, and smaller heads, the 5 rays purple-spotted or spotted and striped with darker orange at base.

65. DYSÒDIA, FETID MARIGOLD. (Name, in Greek, denotes the ill-scent of the plant.) Fl. late summer and autumn.

D. chrysanthemoìdes. Roadsides and river-banks W. & S. W.: a low weed, nearly smooth, with spreading branches, opposite pinnately parted and finely cut leaves, and few yellow rays scarcely exceeding the involucre. ①

66. CICHÒRIUM, SUCCORY, CICHORY, or CHICORY. (Arabic name of the plant.) Fl. all summer.

C. Íntybus, COMMON C. Nat. from Eu. by roadsides, &c. mainly E.: leaves runcinate, rough-hairy on the midrib, or the upper ones on flowering stems small and bract-like, entire; showy blue flowers opening only in the morning and in cloudy weather; deep root used as substitute for coffee. ♃

C. Endívia, ENDIVE, cult. from East Indies, for autumn salad; leaves smooth, slightly or deeply toothed, or much cut and crisped: flowering stems short and leafy. ② ①

67. TRAGOPÒGON, SALSIFY. (Greek name for *goat's-beard,* from the pappus.) Fl. early summer.

T. porrifòlius, COMMON S. or OYSTER-PLANT. Cult. from Eu. for the edible tap-root, sometimes running wild: smooth and pale, 2°–4° high, branching, with long leaves tapering from a clasping base to a slender apex, very large heads on hollow peduncle much thickened upwards, and deep violet-purple flowers. ②

68. LEÓNTODON, HAWKBIT. (Greek name for *lion-tooth,* from the runcinate leaves of some species.)

L. autumnàle, FALL DANDELION or HAWKBIT. Nat. from Europe in meadows and lawns E.: leaves pinnatifid or laciniate; scapes slender, 8′–12′ high, branching; peduncles thickish and scaly-bracted next the small head: fl. summer and autumn. ♃

69. HIERÀCIUM, HAWKWEED (which the name means in Greek). Wild plants of the country, in dry ground: fl. summer and autumn. ♃

H. Canadénse, chiefly N., has simple stems 1° – 3° high and leafy up to the corymbed summit; lanceolate or oblong acute leaves with a few coarse teeth, and rather large heads with loose imbricated involucre.

H. paniculàtum, in woods, has slender and branching leafy stems 2° – 3° high, lanceolate scarcely toothed leaves, a loose panicle of very small 12 – 20-flowered heads on slender peduncles, the involucre very simple.

H. scàbrum, in more open grounds, is roughish-hairy, with rather stout simple stem (2° – 3° high), bearing obovate or oval nearly entire leaves, and a narrow panicle of many small heads, the 40 – 50-flowered involucre and stiff peduncles thickly beset with dark glandular bristles; akenes not tapering.

H. longípilum, in prairies W., is so named from the exceedingly long (often 1′) straight bristly hairs of the stem; has narrow oblong entire leaves, panicle and 20 – 30-flowered involucre between the last and the next, and akenes spindle-shaped.

H. Gronòvii, common in sterile soil, with slender stems leafy and very hairy below, leaves oblong or obovate, panicle narrow, small heads, slender peduncles and 20 – 30-flowered involucre sparingly glandular-bristly, and spindle-shaped akenes with very tapering summit.

H. venòsum, RATTLESNAKE-WEED; common in dry sandy ground, very smooth or with a few hairs; with leaves chiefly at the root, obovate or oblong, thin, purple-tinged beneath and purple-veiny above; scape slender, 1° – 2° high, forking into 2 – 7 slender peduncles bearing small about 20-flowered heads; akenes linear, not tapering.

70. NÁBALUS, RATTLESNAKE-ROOT. (Name from Greek word for a *harp*, alluding probably to the lyrate leaves of some species.) Roots tuberous or spindle-shaped, bitter. Fl. late summer and autumn. ♃

* *Peduncles and 5 – 12-flowered heads smooth: leaves very variable.*

N. altíssimus, TALL R. or WHITE-LETTUCE. Rich woods N., 3° – 6° high, with long and narrow leafy panicle, petioled leaves inclined to be ovate-triangular; heads 5 – 6-flowered; pappus dirty white.

N. álbus, COMMON WHITE-LETTUCE, in open woods, chiefly N. and W., is glaucous, with more corymbed panicles of 8 – 12-flowered heads, usually more cut or divided leaves, and cinnamon-colored pappus.

N. Fràseri, LION'S-FOOT, or GALL-OF-THE-EARTH, is commonest in dry soil E. and S., 1° – 4° high, with narrow-corymbed panicles of 8 – 12-flowered heads, and pappus dull straw-color.

* * *Peduncles and 12 – 40-flowered heads hairy. Chiefly West, on plains, &c.*

N. racemòsus has smooth wand-like stem 2° – 5° high, lance-oblong slightly toothed leaves, the upper ones partly clasping, and a narrow spiked panicle of about 12-flowered heads.

N. ásper is similar, but rough-pubescent, the 12 – 14-flowered heads mostly erect and larger.

N. crepedínius, only W., is smoother, with stout stem 5° – 8° high, wide corymbed panicles of 20 – 40-flowered heads, brown pappus, and broad leaves 6′ – 12′ long on winged petioles.

71. PYRRHOPÁPPUS, FALSE DANDELION. (Name means in Greek *flame-colored pappus*; this and the leafy stems obviously distinguish this genus from the next.) ① ②

P. Caroliniànus, in sandy fields from Maryland S.: 1° – 2° high, with oblong or lanceolate leaves often pinnatifid or cut, the upper partly clasping; fl. spring and summer.

72. TARÁXACUM, DANDELION. (Greek name referring to medicinal properties of the root.) ② ♃

T. Dens-leònis, COMMON D., in all fields, &c., from spring to autumn. Inner involucre closes after blossoming till the akenes mature and the beak

lengthens and elevates the pappus; then the involucre is reflexed, the pappus spreads, and with the fruit is blown away by the wind.

73. LACTÙCA, LETTUCE. (Ancient Latin name, from the milky juice.)

L. sativa, GARDEN LETTUCE. Cultivated from Europe, the broad and tender root-leaves used for salad; stem-leaves heart-shaped and clasping; flowers yellow. ① ②

L. Canadénsis, WILD LETTUCE. Open grounds, 3° – 9° high, with lanceolate or oblong leaves often pinnatifid, sometimes entire; flowers pale yellow, sometimes purple or reddish. ②

74. MULGÈDIUM, FALSE or BLUE LETTUCE. (Name from Latin *mulgeo*, to milk.) Fl. summer, in thicket-borders, &c.

M. acuminàtum, from New York to Ill. & S.; 3° – 6° high, with ovate or lance-ovate barely serrate leaves on winged petioles, blue flowers, and bright white pappus. ②

M. Floridànum, from Penn. W. & S.; like the first, but with all the leaves or the lower ones lyrate or runcinate, uppermost partly clasping. ②

M. leucophæum, in low grounds: resembles Wild Lettuce, and with equally variable lanceolate or oblong often irregularly pinnatifid leaves, very compound panicle of pale blue or bluish-white flowers, and tawny pappus. ②

75. SÓNCHUS, SOW-THISTLE. (Ancient Greek name.) Coarse weeds, with soft-spiny-toothed runcinate-pinnatifid leaves: nat. from Eu.: fl. summer.

S. oleràceus, COMMON S.; in manured soil and damp waste places; 1° – 5° high, acute auricles to the clasping base of the leaves, pale yellow flowers, and akenes wrinkled transversely. ①

S. ásper, like the last, but the leaves less divided and more spiny-toothed, the auricles of their clasping base rounded, and akenes smooth with 3 nerves on each side. ①

S. arvénsis, FIELD S. Less common E.; 1° – 2° high from creeping root-stocks, with larger heads of bright yellow flowers, and bristly peduncles and involucre. ♃

62. LOBELIACEÆ, LOBELIA FAMILY.

Plants with milky acrid juice, alternate simple leaves, and scattered racemed or panicled flowers; the calyx-tube adherent to the many-seeded ovary and pod; the corolla irregularly 5-lobed and mostly split down as it were on the upper side; the 5 stamens united into a tube commonly by their filaments and always by their anthers; style only one.

Downíngia élegans, under the older name of CLINTÒNIA ÉLEGANS, and **D. pulchélla,** formerly CLINTÒNIA PULCHELLA, are delicate little annuals from California, sparingly cultivated. They resemble small Lobelias, with very bright blue flowers, but are known by the very long and slender 1-celled pod, and short tube of corolla not much split down. The first has the 2 narrow lobes approaching each other opposite the 3-lobed lip which has a whitish centre. The second has a larger corolla, with centre of the 3-lobed lip yellow and white, and the 2 other lobes widely diverging. — The other common plants of the order belong to

1. LOBÈLIA (named after the herbalist *De l'Obel* or *Lobel*). Tube of the calyx and 2-celled pod short. Corolla split down on one side, the 5 lobes more or less irregular or unequal. Two or all 5 anthers bearded at top.

* *Exotic, cultivated for ornament.*

L. Erinus, from Cape of Good Hope, the common low and spreading little Lobelia of conservatories and summer gardens, with abundant small flowers azure-blue, usually white in the throat, and narrow toothed upper leaves: ① or continued by cuttings.

L. laxiflòra, from Mexico, cultivated in conservatories under the name of SIPHOCÁMPYLUS BÍCOLOR; tall, with curved and large red and yellow flowers, hanging on long slender peduncles from the axils of the oblong or lanceolate toothed leaves. ♃

* * *Wild species of the country, one or two of them sometimes cultivated for ornament; fl. summer: growing in wet or low grounds, except two of them.*

+ *Corolla deep red: stems tall and simple.*

L. cardinàlis, CARDINAL-FLOWER, with lance-oblong leaves and erect raceme of large and showy flowers, which are very rarely rose-colored or even white. ② ♃

+ + *Flowers blue or with some white in the throat.*

L. inflàta, INDIAN TOBACCO. Somewhat hairy, 9′ - 18′ high, much branched, with ovate toothed leaves, and spike-like leafy racemes of small flowers, the pale blue corolla only 2″ long, and pod inflated. ① Common in fields: a noted quack medicine.

L. syphilítica, GREAT BLUE L. Slightly hairy, 1° - 3° high, leafy, with ovate-oblong irregularly toothed leaves, dense leafy raceme, hairy calyx, and corolla almost 1′ long. ♃

L. pubérula, chiefly S. & W.; *minutely soft-downy, with blunter and* finer-toothed leaves, and rather 1-sided spike of smaller deeper-blue flowers. ♃

L. spicàta, in sandy or gravelly damp or dry soil; smoothish, with long and wand-like stems 1° - 3° high, obovate lowest leaves, narrow and small upper ones, and close naked raceme of very small flowers. ② ♃

L. Kálmii, of wet banks N.; smooth, with branching stems 5′ - 12′ high, obovate root-leaves, few and lanceolate or linear stem-leaves, a loose raceme of slender-pedicelled and small but handsome bright-blue flowers, and obovate pods. ② ♃

63. CAMPANULACEÆ, CAMPANULA FAMILY.

Herbs with milky juice, alternate leaves, and scattered flowers, with regular 5-lobed (blue or white) corolla and 5 stamens borne on the summit of the calyx-tube which is adherent to the 2 - 5-celled many-seeded ovary and pod; style 1; stigmas as many as the cells of the ovary. Stamens separate in all our plants of the order, which by this and by the regular corolla (valvate in the bud) are distinguished from the preceding.

1. SPECULARIA. Corolla nearly wheel-shaped. Stigmas 3. Pod linear or narrow oblong, opening by a *lateral valve or short cleft into each cell.* Otherwise as in the next.
2. CAMPANULA. Corolla bell-shaped, or of various shapes. Stigmas and cells of the short pod 3 - 5, each cell of the latter opening by a lateral valve or short cleft.
3. PLATYCODON. Corolla very broadly open from a narrow base, balloon-shaped in the bud. Pod top-shaped, 5-celled, opening at the top into 3 - 5-valves.

1. SPECULÀRIA, VENUS'S LOOKING-GLASS. (Old Latin name of European species is *Speculum Veneris.*) Fl. all summer. ①

S. Spéculum, GARDEN V., cult. from Eu. for ornament, is a low herb, with oblong leaves, pretty blue flowers terminating the spreading branches, and linear triangular pod.

S. perfoliàta, a wild weedy plant in sterile or sandy ground, with simple stems 3′ – 20′ high, furnished throughout with round-heart-shaped clasping leaves, and small flowers in their axils, only the later ones expanding a small blue corolla; pod oblong.

2. **CAMPÁNULA,** BELLFLOWER or HAREBELL. (Diminutive of Italian or late Latin name for *bell.*) Fl. summer. (Lessons, p. 102, fig. 207.)

* *Wild species of the country, all with 3 stigmas and 3-celled pod.*

C. Americàna, Tall Wild B. Rich moist ground especially W., with stem 3° – 6° high, thin lance-ovate taper-pointed serrate leaves, and long loose spike of flowers, the almost wheel-shaped light-blue corolla 1′ broad, and long curved style. ① ②

C. aparinoides, Small Marsh B. Grassy wet places, with delicate weak stem 8′ – 20′ high, and rough backward on the angles, bearing small lance-linear leaves and a few small flowers on diverging peduncles, the bell-shaped corolla 3″ – 4″ long. ♃

C. rotundifòlia, Common Harebell. On precipices and rocky banks N., with tufted spreading slender stems 5′ – 12′ high, round or heart-shaped root-leaves, dying early, but narrow mostly linear stem-leaves (the specific name therefore unfortunate), and a few slender-peduncled flowers, the blue bell-shaped corolla 6″ – 8″ long. ♃

* * *European species of the gardens: flowers mostly blue, with white varieties.*

+ *Stigmas and cells of the pod 3: no appendages to calyx.* ♃

C. Carpàthica. Smooth, tufted, 6′ – 10′ high, with roundish or ovate petioled small leaves, slender 1-flowered peduncles, and open bell-shaped corolla about 1′ long.

C. rapunculoides. Weedy, spreading inveterately by the root, rather hairy, the erect leafy stems 1° – 2° high, with lowest leaves heart-shaped and petioled, upper lance-ovate and sessile, nodding flowers in the axil of bracts forming a leafy raceme, and tubular-bell-shaped corolla 1′ long.

C. Trachèlium. Roughish-hairy, 2° – 3° high, with more coarsely toothed and broader leaves than the last, and rather larger bell-shaped corolla.

C. persicæfòlia. Smooth, with upright stems 1° – 2½° high, and bearing small lance-linear leaves, root-leaves broader, all beset with minute close teeth; the flowers nearly sessile and erect, rather few in a sort of raceme, the open bell-shaped corolla 1½′ – 2′ long, sometimes double.

+ + *Stigmas and cells of the pod 5: calyx with reflexed leafy appendages.* ① ②

C. Mèdium, Canterbury Bells. Erect, branching, hairy, with coarse toothed leaves, and oblong-bell-shaped flowers 2′ – 3′ long, often double.

3. **PLATYCÒDON.** (A Greek-made name, means *broad bellflower.*) ♃

P. grandiflòrum. Cult. from Siberia; very smooth, pale or glaucous, rather low and spreading, with lance-ovate coarsely toothed leaves, terminal peduncle bearing a showy flower, the broadly expanded 5-lobed corolla fully 2′ broad, blue or white, sometimes double, in summer.

64. ERICACEÆ, HEATH FAMILY.

Very large family, chiefly of shrubs, difficult to define as a whole; the leaves are simple and mostly alternate; the flowers almost all regular, and with as many or twice as many stamens as there are petals or lobes of the corolla; their anthers 2-celled, each cell more commonly opening by a pore or hole at the end; ovary mostly with as many cells as there are lobes to the corolla; style only one, and seeds small.

Epacris is a genus and the type of a family or sub-order of Heath-like shrubs, of Australia, some of them cult. in conservatories.

Epacrises and the like differ from Heaths in their stamens (often inserted on the tube of the corolla) having one-celled anthers. The Heath Family comprises the following subordinate families:—

I. WHORTLEBERRY FAMILY, known by having the tube of the calyx adherent to the ovary, on which the monopetalous corolla and the stamens are therefore mounted. All are shrubs, with scaly buds. Fruit a berry or berry-like.

1. GAYLUSSACIA. Stamens 10: anthers with the cells opening by a chink at the blunt or tapering top. Ovary 10-celled with one ovule in each cell, forming a berry-like fruit containing 10 apparent seeds, or properly little stones. Flowers in lateral racemes; branchlets and leaves beset with resinous or clammy dots or atoms.
2. VACCINIUM. Stamens 10 or 8: anthers tapering up into a tube with a hole at the top. Ovary with several or many ovules in each cell, forming a pulpy many-seeded (rarely rather few-seeded) berry.
3. CHIOGENES. Stamens 8: anthers with short cells minutely 2-pointed, and opening by a large chink down to the middle. Ovary 4-celled, in fruit a white many-seeded berry.

II. HEATH FAMILY PROPER; shrubs or small trees with calyx free from the ovary.

§ 1. HEATHS: *the corolla persisting dry and scarious long after the flowers open, enclosing the pod; the evergreen leaves needle-shaped or minute. Lobes of calyx and corolla 4: stamens 8. No scaly leaf-buds.*

4. ERICA. Corolla of various shapes, 4-toothed or 4-cleft, longer than the calyx. Pod loculicidal. Leaves needle-shaped or linear with margins revolute.
5. CALLUNA. Corolla bell-shaped, 4-parted, much shorter and less conspicuous than the 4 colored and scarious-persistent sepals; below these 2 or 3 pairs of bracts, the inner ones scale-like. Pod septicidal. Leaves very short and small, opposite, crowded, and imbricated.

§ 2. *Corolla deciduous (not remaining dry after flowering).*

* *Monopetalous (or in No. 16 with two of the petals nearly separate).*

+ *Fruit berry-like, containing 5 – 10 seeds or very small stones: calyx dry underneath.*

6. ARCTOSTAPHYLOS. Corolla urn-shaped, 5-toothed, enclosing the 10 stamens; their anthers opening at the top, and 2-awned on the back. Leaves alternate.

++ *Fruit a dry and many-seeded pod,*

++ *But enclosed in the calyx which becomes thick and fleshy, so that the fruit imitates a berry, but has a dry pod inside.*

7. GAULTHERIA. Corolla oblong or short-cylindrical, 5-toothed. Anthers 10, 4-awned or 2-pointed at top, opening only there. Leaves alternate, broad, often spicy-aromatic, evergreen.

++ ++ *Calyx dry and separate from the pod.*

a. *Corolla salver-shaped, 5-lobed; anthers opening lengthwise, not appendaged.*

8. EPIGÆA. Sepals 5, thin and scale-like, ovate-lanceolate, style slender. Leaves evergreen, reticulated, roundish.

b. *Corolla cylindrical, urn-shaped, ovate, or globular, very rarely bell-shaped, the orifice 5-toothed; anthers opening wholly or mainly at the top. All belonged to* ANDROMEDA *of Linnæus, now divided as follows.*

9. CASSANDRA. Calyx of 5 ovate and acute rigid sepals overlapping in the bud, and a pair of similar bractlets at its base. Corolla almost cylindrical. Anthers with tubular tips to the cells, and no awns on the back. Pod flattish from above, when ripe splitting into an outer layer of 5 valves and an inner cartilaginous one of 10 valves. Shrub, with leaves rather scurfy.
10. LEUCOTHOË. Calyx of 5 almost separate sepals a little overlapping in the bud. Corolla ovate-oblong or almost cylindrical. Anthers without tubular tips. Pod flattish from above, 5-valved, loculicidal. Shrubs.

11. ANDROMEDA. Calyx valvate in the early bud; no bractlets. Corolla various. Pod globular or short-ovate, 5-valved, loculicidal. Shrubs.
12. OXYDENDRUM. Calyx valvate in the bud; no bractlets. Corolla ovate. Anthers awnless. Pod conical or pyramidal, 5-valved, loculicidal. Tree.

c. *Corolla (usually large) open-bell-shaped, saucer-shaped, funnel-form, &c., 5-lobed or cleft: anthers short, without awns or other appendages, opening only by holes at the top: filaments long and slender, as is also the style: pod septicidal: leaves entire.*

= *No scaly buds: bracts green, firm, and persistent.*

13. KALMIA. Corolla broadly open, slightly 5-lobed, and with 10 pouches in which the 10 anthers are lodged until extricated by insects, when the bent elastic filaments fly up and discharge the pollen. Pod globular. Leaves evergreen. Flowers in umbels or corymb-like clusters.

= = *Flowers in umbel-like clusters from large scaly terminal buds, their thin scale-like bracts or bud-scales falling as the blossoms are developed. Calyx often minute or obsolete.*

14. RHODODENDRON. Corolla bell-shaped, funnel-form, or various. Stamens 10, often curved to the lower side. Leaves evergreen, or rarely deciduous. Pod mostly oblong.
15. AZALEA. Stamens 5, or rarely more, and leaves deciduous: otherwise nearly as in Rhododendron. And the characters run together, so that Azaleas would hardly be kept distinct, except that they are so familiar in cultivation.
16. RHODORA. Like Azalea, but the corolla strongly irregular, the upper part 3-lobed, the lower of 2 almost or quite separate petals; and stamens 10.

* * *Polypetalous or nearly so: the (white) corolla of 5 equal petals,*

+ *Widely spreading, oval or obovate: leaves evergreen: flowers in a terminal umbel.*

17. LEIOPHYLLUM. Stamens 10: anthers opening lengthwise. Pod 2–3-celled. Leaves small, smooth both sides, glossy, mostly opposite.
18. LEDUM. Stamens 5–10: anthers opening by holes at top. Pod 5-celled. Leaves alternate, thinnish, rusty-woolly underneath. Flowers from scaly terminal buds, as in Azalea.

+ + *Petals less spreading: leaves deciduous: flowers in hoary racemes.*

19. CLETHRA. Sepals and obovate-oblong petals 5. Stamens 10: anthers arrow-shaped and reflexed in the bud, the hole at the top of each cell then at the bottom. Style 3-cleft at the apex. Pod 3-valved, 3-celled, enclosed in the calyx. Leaves alternate, serrate, feather-veined, deciduous.

III. PYROLA FAMILY; evergreen herbs or nearly so, with calyx free from the ovary, corolla of separate petals, anthers turned outwards in the bud, soon inverted, when the holes by which they open are at top. Seeds innumerable, with a loose cellular coat.

20. PYROLA. Flowers in a raceme on a scape which bears rounded leaves at base. Petals roundish, more or less concave. Stamens 10, with awl-shaped filaments. Style long. Valves of pod cobwebby on the edges.
21. MONESES. Flower solitary, with orbicular widely spreading (sometimes only 4) petals, conspicuously 2-horned anthers, large 5-rayed stigma on a straight style, and pod as in the next genus: otherwise like Pyrola.
22. CHIMAPHILA. Flowers several in a corymb or umbel, with orbicular widely-spreading petals, 2-horned anthers on filaments enlarged and hairy in the middle. Very short top-shaped style covered by a broad orbicular stigma, and valves of pod smooth on the edges. Stems leafy below: leaves narrow, smooth and glossy.

IV. INDIAN PIPE FAMILY; herbs destitute of green foliage, parasitic on roots of other plants; commonly represented by one common genus, viz.

23. MONOTROPA. Calyx or 2 or more deciduous bract-like scales. Corolla of 4 or 5 erect spatulate or wedge-shaped petals, resembling the scales of the stem. Stamens 8 or 10: anthers kidney-shaped, opening across the top, style stout: stigma depressed. Pod 4–5-celled, seeds innumerable, minute, resembling fine sawdust.

1. GAYLUSSÁCIA, HUCKLEBERRY or AMERICAN WHORTLEBERRY. (Named for the French chemist *Gay-Lussac.*) Flowers white tinged with reddish, in late spring: the edible fruit ripe late in summer, that of the first species largely gathered for the market.

G. resinòsa, COMMON or BLACK H. Low or rocky ground, common except S. W., 1° – 3° high, clammy-resinous when young, with rigid branches, oval leaves, short one-sided racemes in clusters, rather cylindrical corolla, and black fruit without a bloom.

G. frondòsa, BLUE-TANGLE or DANGLEBERRY. Low grounds from New England S., with diverging slender branches, pale leaves white beneath, slender racemes and pedicels, short corolla, and sweet blue-black fruit with a bloom.

G. dumòsa, DWARF H. Sandy soil near the coast, rather hairy or bristly, with thickish rather shining oblong leaves, long racemes, leaf-like oval bracts to the pedicels, bell-shaped corolla, and insipid black fruit.

2. VACCÍNIUM, CRANBERRY, BLUEBERRY, &c. (Ancient Latin name, of obscure meaning.) Berry edible. (Lessons, p. 104, fig. 216.)

§ 1. BLUEBERRIES, beyond New England commonly called HUCKLEBERRIES; *with leaves deciduous at least in the Northern States; flowers in spring in clusters from scaly buds separate from and rather earlier than the leaves; corolla oblong or short cylindrical, 5-toothed, enclosing the 10 anthers, berries ripe in summer, sweet, blue or black with a bloom, each of the 5 many-seeded cells divided into two.*

V. Pennsylvánicum, DWARF EARLY BLUEBERRY. Dry or barely moist grounds N. and E.: 6′ – 15′ high, with green angular branches, mostly lance-oblong leaves bristly-serrulate and smooth and shining both sides, the sweet berries earliest to ripen.

V. Canadénse, CANADA B. Low grounds only N., is taller, 1° – 2° high, the broader entire leaves and branchlets downy.

V. vacíllans, LOW PALE B. Dry woodlands, less northern; 1° – 3° high, with yellowish branches, smooth and pale or glaucous leaves obovate or oval and entire, and berries ripening later than the first.

V. tenéllum, SOUTHERN B. Low grounds from Virginia S.; 1° – 3° high, with greenish branches rather pubescent, obovate-oblong or oblanceolate leaves scarcely serrulate and often pubescent, ½′ – 1′ long.

V. corymbòsum, COMMON SWAMP B. N. & S. in wet or low grounds: 3° – 10° high, with oval or oblong leaves, either smooth or downy, pale or green, and sweetish berries ripening in late summer; in one downy-leaved variety pure black without a bloom.

§ 2. EVERGREEN BLUEBERRIES *of the South, in low pine barrens, procumbent or only 1° – 2° high, with 5-toothed corolla and 10 stamens.*

V. myrsinites, with stems 6′ – 20′ high, lanceolate or lance-obovate leaves ½′ – 1′ long and mostly pale beneath, and black or blue berries.

V. crassifòlium, with procumbent slender stems, thick and shining oval or oblong leaves ½′ or less in length, their margins revolute, globular-bell-shaped corolla, and black berries.

§ 3. FARKLEBERRY and DEERBERRY; *erect shrubs with single axillary or racemed flowers on slender pedicels, in early summer, open-bell-shaped corolla, 10 stamens, anthers with very slender tubes and 2 awns on the back, and insipid berries ripening late, each of their 5 cells divided into two, and maturing few seeds.*

V. arbòreum, FARKLEBERRY. Open woods from Virg. and S. Ill. S.: 8° – 15° high, evergreen far S., with oval glossy leaves, anthers included in the 5-toothed white corolla, and black mealy berries.

V. stamíneum, DEERBERRY or SQUAW-HUCKLEBERRY. Dry woods, N. & S.: 2° – 3° high, rather downy, with dull and pale ovate or oval leaves, anthers much longer than the greenish or whitish 5-cleft corolla, and large greenish berries.

§ 4. CRANBERRY; *creeping or trailing very slender hardly woody plants, with small evergreen leaves whitish beneath, single flowers in summer, borne on slender erect pedicels, pale rose corolla deeply parted into 4 narrow reflexed divisions, 8 anthers with very long tubes but no awns on the back, and acid red berry 4-celled, ripe in autumn.*

V. Oxycóccus, SMALL C. Cold peat-bogs N. & E.: a delicate little plant, flowering at the end of the stems, the ovate acute leaves (only ¼′ long) with strongly revolute margins, berry only half as large as in the next, often speckled with white, seldom gathered for market.

V. macrocárpon, LARGE or AMERICAN C. Bogs from Virginia N.; with stems 1° to 3° long, growing on so that the flowers become lateral, oblong obtuse leaves sometimes ½′ long, and with less revolute margins, and berries ½′ or more long; largely cultivated for the market E.

3. CHIÓGENES. (Greek-made name, alluding to the snow-white berries.)

C. hispídula, CREEPING SNOWBERRY. Cool peat-bogs and low mossy woods N.; with nearly herbaceous slender creeping stems, very small ovate pointed evergreen leaves, their lower surface and the branchlets beset with rusty bristles, minute axillary flowers in late spring, and white berries ripe in summer: these and the foliage have the flavor of Aromatic Wintergreen.

4. ERÌCA, HEATH. (Ancient Greek name.) All belong to the Old World. The Heaths of the conservatories, blooming in winter, belong to various species from Cape of Good Hope. Of the European species one bears the winter well at the North, and is planted, viz.

E. càrnea (in the form called E. HERBÀCEA), of the Alps; a low undershrub, with linear blunt leaves whorled in fours, and rosy or bright flesh-colored flowers, with narrow corolla rather longer than calyx, in early spring.

5. CALLÙNA, HEATHER, LING. (Name from Greek, *to sweep*, brooms being made from its twigs in Europe.)

C. vulgàris, COMMON H. of North Europe, seldom planted, very sparingly found wild in E. New England and Nova Scotia, &c.: fl. summer.

6. ARCTOSTÁPHYLOS, BEARBERRY (the name in Greek).

A. Uva-Úrsi, COMMON B.; trailing over rocks and bare hills N., forming mats, with thick smooth and entire obovate or spatulate evergreen leaves, and small scaly-bracted nearly white flowers in a short raceme, in early spring, followed by the red austere berries. Leaves used in medicine, astringent and somewhat mucilaginous.

7. GAULTHÈRIA, AROMATIC WINTERGREEN, &c. (Named for *Dr. Gaulthier* or *Gaultier* of Quebec, over 130 years ago.)

G. procúmbens, CREEPING W., BOXBERRY, CHECKERBERRY, &c.; common in evergreen and low woods, spreading by long and slender mostly subterranean runners, sending up stems 3′–5′ high, bearing at summit a few obovate or oval leaves and in summer one or two nodding white flowers in the axils, the edible red "berries" lasting over winter: these and the foliage familiar for their spicy flavor, yielding the *oil of wintergreen*.

G. Shállon, in the shade of evergreen woods of Oregon, &c., and sparingly planted, a shrub spreading over the ground, with glossy ovate slightly heart-shaped leaves about 3′ long, and flowers in racemes.

8. EPIGÆA. (Name in Greek means *on the ground*, from the growth.)

E. rèpens, TRAILING ARBUTUS, GROUND LAUREL, or, in New England, MAYFLOWER. Sandy or some rocky woods, chiefly E., under pines, &c.; pros-

trate, with rusty-bristly shoots, somewhat heart-shaped leaves slender-petioled, and small clusters of rose-colored or almost white spicy-fragrant flowers in early spring.

9. CASSÁNDRA, LEATHER-LEAF. (A mythological name.)

C. calyculàta. Wet bogs N. and mostly E.; low much branched shrub, with small and nearly evergreen dull oblong leaves sprinkled with some fine scurf or scaly atoms, and small white flowers in the axils of the upper leaves forming one-sided leafy racemes, in early spring.

10. LEUCÓTHOË. (Mythological name.) Flowers white, in naked scaly-bracted racemes or spikes, which are formed in summer and open the next year.

§ 1. *Evergreens on moist banks of streams, with very smooth and glossy finely and sharply serrate leaves; the rather catkin-like dense racemes sessile in their axils; bractlets at the base of the short pedicels; flowers in spring, exhaling the scent of Chestnut-blossoms.*

L. Catesbæi, abounds from Virginia S. along and near the mountains, with long recurving branches, ovate-lanceolate and very taper-pointed leaves on conspicuous petioles, and narrowish sepals.

L. axillàris, belongs to the low country S., flowers very early, has broader less pointed leaves on very short petioles, and broad-ovate sepals.

§ 2. *Deciduous-leaved, with one-sided looser racemes at the ends of the branches, flowering in late spring or summer after the membranaceous leaves are developed; bractlets close to the calyx, acute.*

L. racemòsa. Low grounds E. & S.; erect, 4° – 8° high, with oblong acute serrulate leaves a little downy beneath, long and upright racemes, and 4-awned anthers.

11. ANDRÓMEDA. (Mythological name.) Flowers white, rarely tinged with rose, mostly in spring.

§ 1. *Flowers in naked one-sided racemes crowded at the end of the branches, formed in summer and opening early the next spring: leaves evergreen.*

A. floribúnda. Along the Alleghanies S. and planted for ornament; 3° – 10° high, very leafy, the lance-oblong acute leaves serrulate with very fine bristly teeth, abundance of handsome flowers, the ovate-urnshaped corolla strongly 5-angled; anthers 2-awned low on the back.

§ 2. *Flowers in umbel-like clusters: leaves evergreen: stamens 2-awned.*

A. polifòlia. Cold wet bogs N.; 6′ – 18′ high, smooth and glaucous; with lanceolate entire revolute leaves white beneath, flowers in a simple terminal umbel, the corolla almost globular.

A. nítida. Low pine-barrens from North Carolina S.; 2° – 6° high, very smooth, with 3-angled branchlets, ovate or oblong and entire glossy leaves, abundant honey-scented flowers in numerous axillary clusters, and ovate-cylindrical corolla.

§ 3. *Flowers in umbel-like clusters on wood of the previous year, in late spring or early summer: leaves mostly deciduous, but often thickish or coriaceous: pods 5-angled by a prominent rib or ridge at the lines of opening.*

** *Flowers ½′ or more long, nodding, smooth, clustered mostly on leafless shoots: stamens 2-awned. Smooth ornamental shrubs, 2° – 4° high.*

A. speciòsa. Low barrens S., barely hardy N. in cultivation; with oval or oblong blunt and serrate leaves, often mealy-whitened; corolla open bell-shaped.

A. Mariàna, STAGGER-BUSH (the foliage said to poison lambs and calves). Low grounds E. & S.; with glossy oval or oblong entire veiny leaves, and leaf-like lanceolate sepals half the length of the almost cylindrical corolla.

20. PÝROLA, WINTERGREEN, SHIN-LEAF. (Old name, diminutive of *Pyrus*, the Pear-tree, the application not obvious.) Flowers mostly greenish-white, in summer.)

* *Flowers nodding, the petals partly expanding, the hanging style more or less curved, tipped with a narrow stigma, and stamens ascending.*

P. rotundifòlia. Damp or sandy woods; has thick and shining round leaves on short petioles, many-flowered raceme, and blunt anthers: a variety in bogs has rose-purple flowers.

P. ellíptica. Rich woods N.; has thinnish and dull upright leaves on rather long and margined petioles; the greenish-white flowers nearly as in the preceding.

P. chlorántha. Open woods N.; smaller, the scape only 5′ – 6′ high, with a few greenish-white flowers, thick but dull roundish leaves only 1′ long, and anthers short-horned.

* * *Flowers all turned to one side, rather spreading than nodding, the petals conniving, stamens and style straight, stigma large and 5-rayed.*

P. secúnda. Rich woods N. & E.: slender, 3′ – 6′ high, with thin ovate leaves and dense spike-like raceme.

21. MONÈSES, ONE-FLOWERED WINTERGREEN. (Name, from the Greek, refers to the solitary flower.) Flowering in early summer.

M. uniflòra. Cold woods N. E.: with roundish and serrate veiny leaves about ½′ long, scape 2′ – 4′ high, and rather large white or rose-colored flower.

22. CHIMÁPHILA, PIPSISSEWA or PRINCES-PINE. (Name from Greek, means *lover of winter*, i. e. Wintergreen.) Plants of dry woods, branched at base, 3′ – 10′ high, with fragrant wax-like mostly flesh-colored flowers, in early summer.

C. umbellàta, COMMON P. Leaves wedge-lanceolate, sharply serrate, not spotted; flowers 4 – 7, with violet-colored anthers.

C. maculàta, SPOTTED P. Lower, 3′ – 6′ high, with ovate-lanceolate remotely toothed leaves blotched with white, and 1 – 5 flowers.

23. MONÓTROPA, INDIAN PIPE. (Name from the Greek, refers to the flower or summit of the stem turned over to one side or hanging: in fruit it straightens.) Fl. summer.

M. uniflòra, COMMON INDIAN PIPE or CORPSE-PLANT; in rich woods, smooth, waxy-white all over, 3′ – 6′ high, with one rather large nodding flower of 5 petals and 10 stamens.

M. Hypópitys, PINE-SAP or FALSE BEECH-DROPS; in Oak and Pine woods; rather downy, tawny or reddish, fragrant, 4′ – 12′ high, with several smallish flowers in a scaly raceme, having 4 petals and 8 stamens, or the uppermost 5 petals and 10 stamens.

65. AQUIFOLIACEÆ, HOLLY FAMILY.

Trees or shrubs, with alternate simple leaves, small mostly polygamous or diœcious axillary flowers, having divisions of the free calyx, petals (these almost or quite distinct), stamens (alternate with petals), and cells of the ovary of the same number (4 – 6 or even 9, and fruit berry-like, containing 4 – 6 single-seeded little stones. Solitary ovule hanging from the top of each cell. Sessile stigmas 4 – 6, or united into one. Flowers white.

NEMOPÁNTHES CANADÉNSIS, sometimes called MOUNTAIN HOLLY, shrub with slender petals and large dull red berries, in cold woods or bogs N., is the only representative besides the species of

1. ILEX, HOLLY. (Ancient Latin name, which however belonged rather to an Oak than to Holly.) Fl. early summer: fruit autumn.

§ 1. TRUE HOLLY, *with thick and rigid evergreen leaves, red berries, and parts of the flowers in fours, rarely some in fives or sixes.*

I. Aquifòlium, EUROPEAN HOLLY, is occasionally planted, not quite hardy N.; tree with more glossy and spiny leaves, and brighter red berries than

I. opàca, AMERICAN H. Low grounds from E. New England S.; tree 20° – 40° high, smooth, with gray bark, oval leaves wavy-margined and spiny-toothed.

I. Dahòon, DAHOON H. Shrub or small tree, of low pine-barrens from Eastern Virginia S., a little downy, with obovate or oblong-linear short-petioled leaves sparingly toothed above the middle; or, var. MYRTIFÒLIA, with narrower leaves barely 1′ long and mostly entire.

I. Cassìne, YAUPON H. Shrub on the sandy coast S., with oblong or lance-ovate crenate leaves only 1′ long, and flowers in sessile clusters. Leaves used for *Yaupon tea.*

§ 2. PRINOS, &c., *shrubs with deciduous mostly thin leaves, and red berries.*

* *Parts of the flower* 4, 5, *rarely* 6: *nutlets striate on the back.*

I. decìdua. Wet grounds S. & W.; with wedge-oblong or lance-obovate obtusely serrate leaves downy on the midrib beneath, when old glossy above, and with acute calyx-lobes.

I. ambígua. Wet grounds S.; with the thin oval or oblong pointed leaves smooth or smoothish and sharply serrate, and obtuse ciliate calyx-lobes.

I. móllis. Shady grounds along the Alleghanies from Penn. S.; like the last, but soft-downy, and fertile peduncles very short.

* * *Parts of the blossom* 6 (*or sometimes* 5 – 9) *in the fertile,* 4 – 6 *in the sterile flowers: nutlets of the berry smooth and even.*

I. verticillàta, COMMON WINTERBERRY OR BLACK ALDER. Common in low grounds; with obovate or wedge-lanceolate serrate leaves (1½′ – 2′ long) acute or pointed at both ends, the lower surface often downy, very short-peduncled flowers mostly clustered, and very bright scarlet-red berries ripening late in autumn. There is nothing whorled in the leaves or flowers, so that the name is rather misleading.

I. lævigàta, SMOOTH W. Wet grounds along the coast of New England to Virginia; has smoother and narrower minutely serrate leaves glossy above, long-peduncled sterile flowers, and larger less bright berries ripening earlier.

§ 3. INKBERRY; *shrubs with thickish evergreen leaves glossy above, often blackish-dotted beneath, parts of the flower* 6, *or rarely* 7 – 9, *and with black astringent berries, their nutlets smooth and even.*

I. glàbra, COMMON INKBERRY. Along sandy coast from Mass. S., 2° – 4° high; with wedge-oblong few-toothed near the apex, flowers several on the sterile, solitary on the fertile peduncles.

I. coriàcea. Wet soil from Carolina S.; 4° – 8° high, with larger obovate-oblong or oval leaves entire or with scattered sharp teeth.

66. EBENACEÆ, EBONY FAMILY.

Trees, with hard wood, no milky juice, alternate entire leaves, from 2 to 4 times as many stamens as there are lobes to the corolla, several-celled ovary, with a single ovule hanging in each cell, and berry with large hard-coated seeds. Represented only by

1. DIOSPYROS, PERSIMMON, DATE-PLUM. (Ancient Greek name.) Flowers polygamous or diœcious, the fertile ones single in axils of leaves, the sterile smaller and often clustered. Calyx and corolla each 4 – 6-lobed. Stamens about 16 in the sterile, 8 imperfect ones in the fertile flowers,

inserted on the tube of the corolla: anthers turned inwards. Berry edible when very ripe, plum-like, globular, surrounded at base by the persistent thickish calyx. Fl. early summer.

D. Virginiàna, Common P. Southern New England to Illinois and S.: tree 20° – 60° high, with very hard blackish wood, nearly smooth thickish ovate leaves, very short peduncles, 4-parted calyx, pale yellow 4-cleft corolla, 4 styles 2-lobed at tip, 8-celled ovary, and plum-like fruit green and very acerb, but yellow, sweet, and eatable after frost.

67. SAPOTACEÆ, SAPPODILLA FAMILY.

Mainly tropical trees or shrubs, with hard wood, and in other respects also resembling the last family, but mostly with milky juice, perfect flowers, anthers turned outwards, erect ovules, and bony-coated seeds. Represented S. by a few species of

1. **BUMÈLIA.** (Ancient name of a kind of Ash, transferred to this genus.) Flowers small, white or whitish, in clusters in the axils of the leaves. Calyx 5-parted. Corolla 5-cleft, and with a pair of internal appendages between the lobes, 5 good stamens before them, and as many petal-like sterile ones or scales alternating. Ovary 5-celled, hairy: style 1, pointed. Fruit cherry-like, containing a single large stony-coated seed. Small trees or shrubs, with branches often spiny, and deciduous but thickish leaves entire. Fl. summer: fruit purple or blackish. Natives of river-banks, &c.

B. lycioides, from Virginia to Illinois and S., is smooth, with obovate-oblong or lance-wedge-shaped leaves 2′ – 4′ long, and greenish flowers.

B. tènax, still more southern, has smaller leaves brown-silky underneath, and a shorter white corolla.

B. lanuginòsa, in dry soil from S. Illinois S.; has leaves rusty-hairy or woolly beneath, and white corolla.

68. STYRACACEÆ, STORAX FAMILY.

Shrubs or trees, with alternate simple leaves, perfect flowers with 4 – 8 petals more or less united at the base, and bearing twice as many or indefinitely numerous partly monadelphous or polyadelphous stamens, only one style, and a 1 – 5-celled 1 – 5-seeded fruit. Ovules as many as 2 in each cell. Calyx in ours coherent more or less with the 2 – 4-celled ovary.

1. STYRAX. Flowers from the axils of the leaves, white, showy, on drooping peduncles. Calyx scarcely 5-toothed, its base coherent merely with the base of the 3-celled many-ovuled ovary. Corolla open bell-shaped, mostly 5-parted, rather downy outside. Stamens twice as many as the lobes of the corolla, with flat filaments monadelphous at base, and linear anthers. Fruit dry, 1-celled, with usually only one globular hard-coated seed at its base.
2. HALESIA. Flowers in fascicles on hanging pedicels from the axils of the deciduous leaves of the preceding year, white, showy. Calyx 4-toothed, the tube wholly coherent with the 2 – 4-celled ovary. Petals 4, or united into a bell-shaped corolla. Stamens 8 – 16: filaments monadelphous at the base: anthers linear-oblong. Ovules 4 in each cell. Fruit large and dry, 2 – 4-winged, within bony or woody and 1 – 4-celled, a single seed filling each slender cell.
3. SYMPLOCOS. Flowers yellow, in the axils of the thickish leaves, not drooping. Calyx 5-cleft, coherent with the lower part of the 3-celled ovary. Petals 5, broad, nearly separate. Stamens very many in 5 clusters, one attached to the base of each petal: filaments very slender: anthers very short. Fruit 1-celled, 1-seeded, small and dry.

1. STYRAX, STORAX. (The ancient Greek name.) Leaves, &c. with some scurf or starry down. Shrubs, in low pine woods or barrens, from Virginia S.: fl. late spring.

S. grandifòlia, has obovate leaves (2′–6′ long) white downy beneath, and flowers mostly numerous in racemes.

S. pulverulénta, *has oval or obovate leaves less than 2′ long, their lower face scurfy-downy, and fragrant flowers few together or single.*

S. Americàna, has oblong almost glabrous leaves acute at both ends, and flowers 2–4 together or single.

2. HALÈSIA, SNOWDROP- or SILVER-BELL-TREE. (Named for *Stephen Hales*, early writer of essays in vegetable physiology.) Tall shrubs or small trees, flowering in spring just as the leaves appear.

H. tetráptera, FOUR-WINGED H. Along streams from Virginia and the Ohio River S., planted for ornament and hardy N.: tall, smoothish, with oblong finely serrate leaves, 4-lobed corolla, 12–16 strongly monadelphous stamens, and 4-winged fruit.

H. díptera, TWO-WINGED H., confined to low country S.; has coarsely serrate more downy oval leaves, 4 nearly distinct petals (1′ long), 8–12 nearly distinct stamens, and 2-winged fruit.

3. SÝMPLOCOS. (A Greek name, means *growing together*.) Fl. spring.

S. tinctòria, SWEET-LEAF, HORSE-SUGAR. Shrub or small tree, in rich ground S., with coriaceous oblong nearly entire almost evergreen leaves, pale beneath, and small odorous flowers in close sessile bracted clusters. Leaves sweet-tasted, greedily eaten by cattle.

69. PLANTAGINACEÆ, PLANTAIN FAMILY.

Consists almost entirely of the very familiar weedy genus

1. PLANTÀGO, PLANTAIN, RIBGRASS. (The old Latin name.) Flowers in a spike, on a naked scape, small, whitish. Sepals 4 (or rarely 3 from two of them growing together), imbricated, persistent. Corolla short salver-form, thin and membranaceous, usually becoming scarious and dry, or withering on the pod; lobes 4. Stamens 4 (or rarely 2) borne on the tube of the corolla: filaments usually lengthening suddenly at flowering time and hanging (as in Grasses), bearing the 2-celled anthers. Style and long hairy stigma single and thread-like. Ovary 2-celled. Pod 2-celled, a *pyxis*, the top falling off as a lid, and the partition then falling out along with the 2 or more seeds. Leaves parallel-ribbed, all from the ground. The following are the common species: fl. summer.

§ 1. *Flowers all alike and perfect, in each the style protruded a day or two before the anthers open or are hung out: lobes of corolla remaining wide open.*

P. màjor, COMMON PLANTAIN, in yards, &c. Usually smooth or smoothish, with ovate or oval 5–7-ribbed leaves, a slender spike, and 7–16-seeded pod. ♃

P. lanceolàta, RIBGRASS, RIPPLEGRASS, or ENGLISH PLANTAIN. Nat. from Eu. in fields: rather hairy, with lanceolate or lance-oblong 3–5-ribbed leaves, a grooved-angled scape, thick and close spike, two of the sepals mostly united into one, and 2-seeded pod. ♃

P. marítima, SEASIDE P. Salt-marshes N. E.: smooth, with linear thick and fleshy sometimes almost terete leaves, showing no ribs, slender spike, and 2–4-seeded pod. ① ♃

§ 2. *Flowers almost diœcious, or of 2 sorts, one with 4 long stamens and open corolla, the other with minute short stamens, and corolla closing permanently over the pod.*

P. Virgínica. Sandy grounds mostly S.: small, pubescent, with obovate or lance-spatulate 3–5-ribbed leaves, a small spike, and 2-seeded pod.

70. PLUMBAGINACEÆ, LEADWORT FAMILY.

Known by the flowers with parts five throughout, viz. 5-lobed plaited calyx, 5 stamens opposite as many petals or lobes of the corolla and almost separate from them, 5 styles or 5 stigmas, and the free ovary 1-celled, containing a single ovule hanging on a slender stalk which rises from its base; the fruit a small utricle.

§ 1. *Low hardy herbs, with leaves all from the root, and flowers on scapes, having a funnel-shaped scarious calyx, nearly or quite separate petals tapering at base, and 5 almost or quite separate styles.*

1. ARMERIA. Tufted plants with evergreen very narrow and entire leaves, simple scapes bearing a head of rose-colored flowers, and styles plumose-hairy towards the base.
2. STATICE. Broadish-leaved herbs, with scapes branching into a panicle, bearing 3-bracted flowers or clusters: styles smooth.

§ 2. *Plants of warm regions, with branching mostly woody stems bearing alternate entire leaves, and bracted spikes of handsome flowers, having a tubular calyx and corolla, and one style bearing 5 stigmas.*

3. PLUMBAGO. Calyx 5-toothed at the apex, glandular along the 5 ribs or angles. Corolla salver-form, with long tube.

1. ARMÈRIA, THRIFT. (Old Celtic name latinized.) Fl. summer. ♃

A. vulgàris (also called A. MARÍTIMA), COMMON THRIFT, wild on shores of Europe, &c., cult. in gardens for edgings, &c., with short spreading leaves and scape 3′ – 6′ high.

2. STÁTICE. (Ancient Greek, meaning *astringent*, the roots used as such in popular medicine.) A few species of the Old World are cult. in choice gardens, but not commonly. ♃

S. Limònium, SEA-LAVENDER or MARSH-ROSEMARY. Along the coast in salt-marshes: with oblong or spatulate thick and pale leaves on slender petioles, scapes 1° – 2° high, bearing lavender-colored flowers all summer.

3. PLUMBÀGO, LEADWORT (which the Latin name denotes). The following are cult. in conservatories, or turned out to flower all summer.

P. Capénsis, CAPE L., with somewhat climbing angled stems, oblong spatulate leaves, and large pale or lead-blue corolla, the tube $1\frac{1}{2}'$ long.

P. coccínea, RED-FLOWERED L., of the East Indies, is more tender, with deep red flowers.

P. Zeylànica, WHITE-FLOWERED L., of the East Indies, with smaller white flowers.

71. PRIMULACEÆ, PRIMROSE FAMILY.

Herbs with regular perfect flowers, the stamens borne on the corolla, and as many as its divisions and opposite them, one style and stigma, and many or sometimes few ovules on a free central placenta of the one-celled ovary, in fruit a pod.

§ 1. *With leaves all from the root and simple, the flowers on a scape,*

* *From a fibrous-rooted crown or root-stock.*

1. PRIMULA. Calyx 5-toothed or 5-cleft, often angled. Corolla salver-shaped or funnel-shaped with 5 spreading lobes; the stamens included in its tube. Pod opening by valves or teeth at the top. Flowers in an umbel, which is sessile in one species, but usually raised on a scape.
2. DODECATHEON. Calyx 5-parted, reflexed. Corolla 5-parted; the divisions lanceolate, strongly reflexed. Stamens conniving in a long slender cone, the linear anthers very much longer than the short partly monadelphous filaments. Pod splitting into 5 valves. Flowers in an umbel.

* * *From a depressed or biscuit-shaped fleshy corm.*

3. CYCLAMEN. Flower resembling that of Dodecatheon, but only one on a scape or stalk. Anthers sessile, pointed.

§ 2. *With leafy stems, the leaves simple and chiefly entire,*

* *In one whorl at the summit of the slender stem: parts of the flower* 7.

4. TRIENTALIS. Calyx and corolla wheel-shaped, of mostly 7 divisions united only at base, those of the former linear-lanceolate, of the latter oblong, of both pointed. Filaments united in a ring at base: anthers oblong, curving when old. Flowers white.

* * *In pairs or whorls along the stems: parts of the flower mostly* 5.

5. LYSIMACHIA. Corolla yellow, wheel-shaped, 5-parted (or rarely of 5, 6, or even 7 nearly or quite separate narrow petals). Filaments beardless, often monadelphous at base. Pod splitting into valves.

6. ANAGALLIS. Corolla red, blue, or white, wheel-shaped, the 5 divisions broad. Filaments bearded. Pod (a pyxis) open by a transverse division, the top falling off as a lid, many-seeded.

* * * *Alternate leaves along the branching stems: base of calyx and ovary coherent.*

7. SAMOLUS. Calyx 5-cleft. Corolla bell-shaped, 5-cleft, with a little body like a sterile filament in the clefts. Stamens included. Pod many-seeded, splitting into 5 valves. Flowers small, white, in racemes.

§ 3. *With hollow inflated leafy stems; the leaves whorled or scattered, the lower ones pinnately parted: parts of the flower* 5.

8. HOTTONIA. Calyx 5-parted. Corolla short salver-shaped: stamens included. Pod opening by 5 clefts down the side, many-seeded. Flowers small, in whorls along the upper part of the stem and branches.

1. PRÍMULA, PRIMROSE, COWSLIP, &c. (Name from *primus*, spring, from the flowering-time of true Primrose.) ♃ Two small species are scarce along our northern borders (see Manual): the following are the common ones cult. for ornament.

* *Tender house-plant, with inflated conical calyx, and round-heart-shaped 7-9-lobed leaves.*

P. Sinénsis, CHINESE PRIMROSE, a downy plant, with often proliferous umbels of large and showy flowers, purple, rose, or white, sometimes double, in one variety cut-fringed.

* * *Hardy or nearly so, from Eu., with large tubular or oblong-bell-shaped angled calyx, and wrinkled-veiny oblong or spatulate leaves tapering into short wing-margined petioles: flowers naturally yellow, in spring.*

P. grandiflòra (or ACAÙLIS), TRUE PRIMROSE, has leaves somewhat hairy beneath, and the large flowers rising on slender pedicels from their axils, the proper scapes not developed; corolla flat, sulphur-yellow.

P. officinàlis (or VÈRIS), ENGLISH COWSLIP; somewhat pubescent with minute pale down, scapes bearing the umbels above the leaves, much smaller flowers of deeper color, and the limb of corolla rather concave or cup-like, the throat commonly orange. The sorts of POLYANTHUS are cultivated varieties, with flowers enlarged, of various colors, or partycolored, often more or less double.

* * * *Scarcely hardy N., with bell-shaped calyx much shorter than the funnel-shaped corolla, and smooth and thick obovate leaves, mostly covered with some fine mealiness.*

P. Aurícula, AURICULA, of Southern Europe; low, with sessile leaves, and scape bearing a few fragrant flowers, these pale yellow, with varieties white, purple, or of various hues, sometimes full double.

2. DODECÀTHEON. (Fanciful name, from Greek for *twelve gods*.) ♃

D. Meàdia, called SHOOTING-STAR at the West, or sometimes AMERICAN COWSLIP: in rich open woods from Penn. S. and especially W., and cult. for ornament; smooth, with a cluster of oblong or spatulate leaves around the base

of a simple scape, 6′ – 2° high, which has an umbel of several or many handsome rose-purple or often white flowers nodding on the slender pedicels, becoming erect in fruit: fl. late spring.

3. CYCLAMEN. (Classical name for the wild plant of Europe called Sowbread.) Cult. in this country as house-plants for winter-flowering. Flowers rose-colored, pink, or white, nodding on the apex of the stalk, the reflexed lobes turned upwards. ♃

C. Europæum, Common C. Corm 1′ – 2′ in diameter, sending up heart-shaped thick sometimes angled leaves, often marked with white above and crimson-purple or violet beneath, on slender petioles, and flowers with open throat and oval or oblong divisions, the flower-stalks coiled up after flowering so as to bring the pod to the ground to ripen.

C. Pérsicum, Persian C., is more tender, with longer and lanceolate divisions and less open throat to the corolla, the flower-stalks not coiling after blossoming.

4. TRIENTÀLIS, CHICKWEED-WINTERGREEN. (From Latin for the third part of a foot, the usual height of the European species.) ♃

T. Americàna, American C. or Star-flower. In open low woods, especially N.: a pretty plant, the stem bearing a few scales below, and at top a whorl of long-lanceolate leaves tapering to both ends, also 2 or 3 slender-stalked delicate flowers with taper-pointed petals, in spring.

5. LYSIMÀCHIA, LOOSESTRIFE (which the name means in Greek). Fl. summer. ♃

§ 1. *Wild species of the country, in low or wet grounds: corolla yellow.*

L. thyrsiflòra. Wet swamps N.: smooth, with simple stem leafless at base, above with lanceolate sessile leaves, in the axils of one or two of them a short-peduncled oblong spike or cluster of small flowers, having slender filaments and lance-linear mostly separate purplish-dotted petals, and as many little teeth between them.

L. stricta. Common N. & S.: smooth, very leafy, branching, with mostly opposite lanceolate sessile dark-dotted leaves tapering to each end, flowers on slender pedicels in a terminal long raceme leafy at base, unequal filaments monadelphous, and lance-oblong lobes of corolla blackish-streaked.

L. quadrifòlia. Sandy moist ground: rather hairy, with ovate-lanceolate sessile leaves 4 (or 3 – 6) in a whorl, slender peduncles in the axils of the upper ones, and ovate-oblong lobes of corolla dark-streaked.

L. ciliàta. Low thickets; with erect stems 2° – 3° high, opposite dotless leaves lance-ovate with rounded or heart-shaped ciliate base and on fringed petioles, flowers nodding on slender peduncles from the upper axils, light yellow corolla not streaked nor dotted, the lobes round-ovate and wavy-margined or denticulate, little longer than the sepals.

L. radicans, from Virginia S. W., resembles the foregoing, but stems or branches reclined and rooting, and leaves and flowers smaller by half.

L. lanceolàta, commonest W. & S., is similar, but with oblong or linear leaves mostly narrowed into short and margined petioles.

L. longifòlia, from Western New York W., has similar but deeper yellow flowers, and sessile linear blunt stem-leaves of thicker texture.

§ 2. *European species in cultivated grounds, &c.*

L. vulgàris, Common L. of Europe: a rather stout downy plant, 2° – 3° high, with oblong or lance-ovate leaves 3 or 4 in a whorl, flowers in panicles, and monadelphous filaments.

L. nummulària, Moneywort: trailing and creeping in damp garden-grounds, or running wild sometimes; smooth, with opposite small round leaves, and solitary flowers in their axils on short peduncles. (Lessons, p. 77, fig. 155.)

6. ANAGÁLLIS, PIMPERNEL. (Old Greek name, meaning *delightful.*) Low herbs of the Old World, flowering all summer.

A. arvénsis, COMMON P. or POOR-MAN'S WEATHER-GLASS, the small (red, purple, or white) flowers said to close at the approach of rain; in gardens and running wild in sandy fields; spreading on the ground, with pale ovate leaves shorter than the peduncles, and rounded petals fringed with minute glandular teeth. ①

A. cærùlea, BLUE P., of the gardens, a tender mostly larger form of the preceding, with larger blue flowers. ①

7. SÁMOLUS, WATER-PIMPERNEL, BROOKWEED. (Old name, of unknown meaning.) Fl. late summer. ① ♃

S. Valerándi, var. **Americànus.** Along rills and wet places; spreading, 6′ – 10′ high, with obovate leaves, and very small flowers on slender pedicels, which bear a bractlet at the middle, but no bract at base.

8. HOTTÓNIA, WATER VIOLET or FEATHERFOIL. (Named for a *Prof. Hotton* of Holland.) Fl. summer. ♃

H. inflàta. A singular plant in pools and ditches, smooth, with stems and branches much inflated except at the joints, bearing finely cut pectinate leaves; flowers white.

72. LENTIBULACEÆ, BLADDERWORT FAMILY.

Aquatic or marsh herbs, with the ovary and pod as in Primrose Family, but with irregular bilabiate flowers bearing a spur or sac underneath, and only 2 stamens: — represented by the two following genera.

1. UTRICULARIA. Calyx parted into 2 nearly entire lips. Corolla deeply 2-lipped, the lower lip bearing above a prominent palate closing the throat, and below a large spur. Anthers 2, converging in the throat of corolla. Stigma 2-lipped. Leaves finely cut, mostly into threads or fibres, many bearing little air-bladders; some are leafless.
2. PINGUICULA. Upper lip of calyx 3-cleft, lower 2-cleft. Lips of corolla distinctly lobed, the hairy or spotted palate smaller, so that the throat is open. Otherwise as in Utricularia. Leaves all in a tuft at base of the 1-flowered scapes, broad and entire, soft and tender.

1. UTRICULÀRIA, BLADDERWORT. (*Utriculus*, a little bladder.) Fl. all summer. The following are the commonest species.

* *Floating, branching, bladder-bearing: corolla violet-purple.*

U. purpùrea. Only E. & S., with 2 – 4 flowers on the peduncle, and a rather short spur appressed to the 3-lobed lower lip of corolla.

* * *Floating, branching, bladder-bearing: corolla yellow.*

U. inflàta. Only E. & S.: swimming free, the petioles of the whorl of leaves around base of the 5 – 10-flowered scape inflated into oblong bladders, besides little bladders on the thread-like divisions of the leaves.

U. vulgàris, LARGE B. Common in still or slow water; the stems 1° – 3° long and very bladder-bearing on the thread-like many-parted leaves; flowers 5 – 10 in raceme, large, with spur rather shorter than lower lip.

U. intermèdia. Chiefly N. in shallow water, with stems 3′ – 6′ long, *bearing rather rigid leaves with linear-awl-shaped divisions,* and no bladders, these being on separate leafless branches, the slender raceme few-flowered; spur nearly equalling the very broad lower lip.

U. gíbba. Chiefly Middle States: small, with short branches bearing sparse thread-like leaves and some bladders, 1 – 2-flowered peduncles only 1′ – 3′ high, and blunt conical spur shorter than lower lip.

U. biflòra. Chiefly S.: stems 4′ – 6′ long, bearing rootlet-like leaves and many bladders, 1 – 3-flowered peduncles 2′ – 4′ high, and awl-shaped spur as long as lower lip.

* * * *Simple and erect naked scape-like stem rooting in wet soil, with minute and fugacious grass-like leaves seldom seen: commonly no bladders: flowers yellow.*

U. subulàta, from N. Jersey S. in wet sand; very slender, 3′ – 5′ high, with several very small slender-pedicelled flowers.

U. cornùta. In bogs N. & S.; 6′ – 15′ high, bearing 2 – 4 large flowers crowded together on short pedicels, or S. with 4 – 12 more scattered and smaller flowers.

2. PINGUÍCULA, BUTTERWORT. (Name from Latin, *pinguis*, fat. Both names from the fatty or greasy-looking leaves, which in ours are more or less clammy-pubescent.)

* *Corolla violet-purple; the upper lip 2-lobed, lower 3-lobed.*

P. vulgàris, is scarce on wet rocks along our northern borders; scape 2′ high; upper lip of corolla short; spur straightish and slender: fl. summer.

P. pùmila, in moist sand from Georgia S. & W., has rather large flower on scape 2′ – 6′ high, with blunt sac-like spur: fl. spring.

P. elàtior, borders of ponds from N. Carolina S., has scapes near 1° high, and large corolla (1′ wide) with blunt spur: fl. summer.

* * *Corolla yellow, more bell-shaped, less distinctly 2-lipped, the 5 lobes often cleft.*

P. lùtea. Wet pine barrens S.; whole plant yellowish, with nodding flower (1′ or more wide) on scape 6′ – 12′ high, in spring.

73. BIGNONIACEÆ, BIGNONIA FAMILY.

Woody plants, or a few herbs, with more or less bilabiate flowers, diandrous or didynamous stamens (often with rudiments of the wanting ones), 2-lipped stigma, free variously 1 – 4-celled ovary, and fruit, usually a pod, containing many large mostly flat and winged seeds, filled with the large embryo: no albumen.

I. BIGNONIA FAMILY PROPER; almost all woody plants, with opposite leaves, 1 – 2-celled pods, and flat winged seeds. (Lessons, p. 135, fig. 316.)

§ 1. *Climbers, with compound leaves and 4 fertile stamens in two pairs.*

* *Barely woody or herbaceous: ovary and pod one-celled with 2 parietal placentæ.*

1. ECCREMOCARPUS. Calyx 5-cleft, short. Corolla tubular, with 5 short and round recurved lobes. Pod short. Seeds winged all round.

* * *Woody-stemmed: ovary and pod 2-celled, but the placentæ parietal: valves of pod falling away from the partition: seeds with a broad thin wing.*

2. BIGNONIA. Calyx nearly truncate. Corolla tubular bell-shaped, 5-lobed. Pod flattened parallel with the valves and partition. Climbing by leaf-tendrils.

3. TECOMA. Calyx 5-toothed. Corolla funnel-shaped, tubular, or bell-shaped, 5-lobed. Pod flattish or flattened contrary to the partition, the edges of which separate from the middle of the valves. Leaves in ours odd-pinnate. The hardy species climb by rootlets.

§ 2. *Trees, with simple leaves and 2 or rarely 4 fertile stamens.*

4. CATALPA. Calyx deeply 2-lipped. Corolla inflated bell-shaped, the 5-lobed border more or less 2-lipped and wavy. Pod very long and slender, hanging: the partition contrary to the valves. Narrow wings of the seed lacerate-fringed. (For corolla and stamens, see Lessons, p. 95, fig. 196.)

II. SESAMUM FAMILY, &c.; herbs, with simple leaves, some of the upper ones alternate, and 4-celled ovary and fruit (but the stigma of only 2 lips or lobes), containing flat but thick-coated wingless seeds.

5. SESAMUM. Calyx 5-parted, short. Corolla tubular bell-shaped, 5-lobed; the 2 lobes of the upper lip shorter than the others. Stamens 4. Fruit an oblong obtusely 4-sided pod, 2-valved. Flowers solitary in the axils of the leaves, almost sessile.

6. MARTYNIA. Calyx 5-toothed, often cleft down one side. Flowers large, in terminal corymb or raceme.

1. ECCREMOCÁRPUS. (Name, from the Greek, means *hanging fruit.*)

E. scàber, or Calámpelis scaber, from Chili, cult. in gardens and conservatories; tender, climbs by branched tendrils at the end of the twice pinnate leaves; leaflets roughish or smoothish, thin, ovate or heart-shaped; flowers in loose drooping racemes; corolla inflated-clubshaped and gibbous, orange-red, about 1′ long.

2. BIGNÒNIA. (Named for the French *Abbé Bignon.*) Our only true native Bignonia is

B. capreolàta. Climbing trees from S. Virg. to Ill. and S.; smooth, the leaves evergreen at the south, with a short petiole and often what seems like a pair of stipules in the axil, a single pair of lance-oblong leaflets heart-shaped at base, and a branched tendril between them; flowers several in the axils, the corolla 2′ long, orange-red outside, yellow within, in spring.

3. TÉCOMA, TRUMPET-FLOWER. (Mexican name abridged.) Formerly under Bignonia, which name the species still bear in cultivation. Fl. late summer.

T. radìcans, Wild T. or Trumpet-Creeper. Wild from Penn. and Ill. S., planted farther N.; climbing freely by rootlets; leaves of 5 – 11 ovate or lance-ovate taper-pointed and toothed leaflets; flowers corymbed; orange-yellow and scarlet corolla funnel-shaped.

T. grandiflòra, Great-flowered T. Cult. from Japan and China, not quite hardy N., climbing little, with narrower leaflets, and 5-cleft calyx nearly equalling the tube of the corolla, which is bell-shaped, 3′ long and broad, much wider than in the foregoing.

T. Capénsis, Cape T. of conservatories, has smaller and rounder leaflets, naked-peduncled cluster of flowers, long-tubular and curving orange-colored corolla 2′ long, and stamens protruded.

T. jasminoìdes. A fine greenhouse species, from Australia, twining, very smooth, with lance-ovate entire bright green leaflets, and white corolla pink-purple in the throat.

4. CATÁLPA, or INDIAN BEAN. (Aboriginal name; the popular name alludes to the shape of the pods.)

C. bignonioìdes, Common Catalpa. Tree wild S. W., and widely planted; with large heart-shaped pointed leaves downy beneath, open panicles (in summer) of white flowers (1′ long) variegated and dotted within with some yellow and purple, and pods 1° long.

C. Kæmpferi, of Japan, beginning to be planted, has smooth leaves, many of them 3-lobed or angled, and flowers one half smaller.

5. SÉSAMUM, SESAME. (The Greek name, from the Arabic.) ①

S. Índicum, from India and Egypt, somewhat cult. or running wild in waste places far S.; rather pubescent, with oblong or lanceolate leaves, the lower often 3-lobed or parted, pale rose or white corolla 1′ long, and sweet oily seeds, used in the East for food, oil, &c.

6. **MARTYNIA**, UNICORN-PLANT. (Named by Linnæus for *Prof. Martyn.*) Clammy-pubescent and heavy-scented rank herbs, with long-petioled rounded and obliquely heart-shaped wavy-margined leaves, and large flowers, in summer. ①

M. proboscidea, COMMON U. Wild S. W., and cult. in gardens; coarse, with nearly entire leaves, large corolla whitish with some purple and yellow spots, and long-beaked fruit.

M. fràgrans, SWEET-SCENTED U. Cult. from Mexico; less coarse and clammy, with somewhat 3-lobed or sinuate-toothed leaves, and showy violet-purple vanilla-scented flowers.

74. GESNERIACEÆ, GESNERIA FAMILY.

Tropical plants, with 2-lipped or somewhat irregular corollas, didynamous stamens, a one-celled ovary with two parietal many-seeded placentæ, — therefore botanically like the next family; but with green herbage, and not parasitic, and the common cultivated species have the tube of the calyx coherent at least with the base of the ovary. Many, and some very showy, plants of this order are in choice conservatories; the commonest are the following.

Gloxinia speciòsa. An almost stemless herb, with ovate and crenately toothed leaves and 1-flowered scape-like peduncles; the deflexed corolla 2′ long, ventricose, between bell-shaped and funnel-form, gibbous, with a short and spreading somewhat unequal 5-lobed border, violet with a deeper-colored throat, in one variety white. ♃

Gesnèria zebrina. Stem tall, leafy; leaves petioled, cordate, velvety, purple-mottled; a terminal raceme of showy flowers nodding on erect pedicels; corolla tubular-ventricose, with a small 5-lobed and somewhat 2-lipped border, glandular, scarlet, with the under side and inside yellow and dark-spotted. — There are several other species. ♃

Achimènes longiflòra. Stem leafy; flowers in the axils of oblong or ovate hairy leaves, which they exceed; tube of the obliquely salver-shaped corolla over an inch long, narrow, the very flat 5-lobed limb 2′ or more broad, violet-colored above, — also a white variety. Propagates by scaly bulblets from the root. ♃

75. OROBANCHACEÆ, BROOM-RAPE FAMILY.

Low, root-parasitic perennials, destitute of green herbage, and with yellowish or brownish scales in place of leaves, the monopetalous corolla more or less 2-lipped or irregular, 4 didynamous stamens, and one-celled ovary and pod with the 2 or 4 parietal placentæ covered with innumerable small seeds. Ours occur in woods, and mostly parasitic on the roots of trees.

1. EPIPHEGUS. Stems slender and bushy-branching, with small and scattered scales and two sorts of flowers, scattered in loose spikes or racemes, with minute bracts. Upper flowers conspicuous, but seldom ripening fruit, with tubular 4-toothed corolla, and long filaments and style; lower flowers small and short, seldom opening, but fertilized in the bud.
2. CONOPHOLIS. Stems thick, covered with firm overlapping scales, each of the upper ones with a flower in its axil, forming a spike. Calyx 4–5-toothed, and split down on the lower side. Corolla short, strongly 2-lipped; upper lip arched and notched; lower one spreading and 3-cleft. Stamens protruding.
3. APHYLLON. Stems are chiefly slender 1-flowered scapes from a scaly mostly subterranean base. Calyx 5-cleft. Corolla with a long curved tube, and a spreading slightly 2-lipped or irregular 5-lobed border; the lobes all nearly alike. Stamens included in the tube.

1. EPIPHÈGUS, BEECH-DROPS, CANCER-ROOT. (Name in Greek means *on the Beech*: the plant chiefly found parasitic on the roots of that tree.) One species,

E. Virginiàna. Common, about 1° high, with purplish flowers ½' or more long, in late summer and autumn.

2. CONÓPHOLIS, SQUAW-ROOT, CANCER-ROOT. (The name is Greek for *cone-scale*, the plant having the aspect of a slender fir-cone when old.) One species.

C. Americàna. Not widely common, in oak woods, forming clusters among fallen leaves, 3' – 6' long, as thick as the thumb, yellowish: fl. early summer.

3. APHÝLLON, NAKED BROOM-RAPE or ONE-FLOWERED CANCER-ROOT. (Name in Greek means *without leaves*.) Fl. spring and early summer.

A. uniflòrum. Open woods or thickets: slightly clammy-pubescent, with 1 – 3 scapes (3' – 5' high) from a subterranean scaly base, and lance-awl-shaped calyx-lobes half the length of the violet-purplish corolla.

A. fasciculàtum, the other species, occurs only from Northern Michigan W.; has scapes from a scaly base rising out of the ground, and short triangular calyx-lobes.

76. SCROPHULARIACEÆ, FIGWORT FAMILY.

Known on the whole by the 2-lipped or at least more or less irregular monopetalous corolla, 2 or 4 didynamous stamens, single style, entire or 2-lobed stigma, and 2-celled ovary and pod containing several or many seeds on the placentæ in the axis; these with a small embryo in copious albumen. But some are few-seeded, a few have the corolla almost regular, and one or two have 5 stamens, either complete or incomplete. A large family, chiefly herbs, some shrubby, and one species is a small tree.

§ 1. *Intermediate between this family and the Nightshade Family; the flowers terminal or lateral, never really from the axils of the leaves or bracts; the corolla hardly if at all sensibly 2-lipped, sometimes almost regular, the lobes plaited in the bud: stigma enlarged, often 2-lipped. All garden exotics.*

* *With 4 stamens only, included within the narrow throat of the salver-shaped corolla: leaves alternate and entire.*

1. BRUNFELSIA. Shrubs, with glossy oblong leaves. Corolla with 5 rounded and about equal lobes, two of them, however, a little more united. Anthers all alike. Fruit fleshy.
2. BROWALLIA. Herbs, mostly a little pubescent and clammy. Corolla with somewhat unequally 5-lobed border, the lobes with a broad notch. Two of the anthers shorter and only 1-celled. Fruit a dry pod.

* * *With 4 anther-bearing stamens and a sterile filament: corolla with wide throat.*

3. SALPIGLOSSIS. Herbs, with cut-toothed or pinnatifid alternate leaves. Corolla funnel-form, with very open throat, a little oblique or irregular, the lobes all with a deep notch at the end. Pod oblong.

§ 2. *Corolla imbricated and not plaited in the bud; the smaller lip 3-parted; the larger 5-cleft, and the lobes again 2-cleft or deeply notched. Flowers terminal, panicled.*

. SCHIZANTHUS. Calyx 5-parted, the divisions narrow. Corolla with tube shorter than the divisions, which appear as if cut up, the middle lobe of the smaller lip, towards which the stamens and style are inclined, more or less hooded or sac-like. Stamens with good anthers 2, the 2 or 3 others small and abortive. Stigma minute. Leaves alternate, pinnate, or pinnately cut.

§ 3. *Corolla with lobes imbricated and not plaited in the bud, either 2-lipped or more or less irregular, the divisions or lobes at most 5. Peduncles from the axil of leaves or bracts, no flower ever really terminating the main stem or branches.*

* *Tree, with large and opposite Catalpa-like leaves.*

5. PAULOWNIA. Calyx very downy, deeply 5-cleft. Corolla decurved, with a cylindrical or funnel-form tube, and an enlarged oblique border of 5 rounded lobes. Stamens 4, included. Pod turgid, thick, filled with very numerous winged seeds.

* * *Herbs, or a few becoming low shrubs.*

+ *With 5 anther-bearing stamens and a wheel shaped or barely concave corolla.*

6. VERBASCUM. Flowers in a long terminal raceme or spike. Calyx 5-parted. Corolla with 5 broad and rounded only slightly unequal divisions. All the filaments or 3 of them woolly. Style expanding and flat at apex. Pod globular, many-seeded. Leaves alternate.

+ + *With only 2 or 4 anther-bearing stamens.*

++ *Corolla wheel-shaped, or at least with wide spreading border mostly much longer than the short tube: flowers single in the axils of the leaves or collected in a raceme or spike.*

7. CELSIA. Like Verbascum, but with only 4 stamens, those of 2 sorts.
8. ALONSOA. Calyx 5-parted. Corolla very unequal, turned upside down by the twisting of the pedicel, so that the much larger lower lobe appears to be the upper and the two short upper lobes the lower. Stamens 4. Pod many-seeded. Lower leaves opposite or in threes.
9. VERONICA. Calyx 4-parted, rarely 3-5-parted. Corolla wheel-shaped, or sometimes salver-shaped, with 4 or rarely 5 rounded lobes, one or two of them usually rather smaller. Stamens 2, with long slender filaments. Pod flat or flattish, 2-many-seeded. At least the lower leaves opposite or sometimes whorled.

++ ++ *Corolla salver-shaped, with almost regular 4-5-lobed border: flowers in a terminal spike. Here one species of No. 9 would be sought.*

10. BUCHNERA. Calyx tubular, 5-toothed. Corolla with a slender tube, and the border cleft into 5 roundish divisions. Anthers 4 in 2 pairs, one-celled. Style club-shaped at the apex. Pod many-seeded. Leaves mainly opposite, roughish.

++ ++ ++ *Corolla either obviously 2-lipped, or funnel-form, tubular, or bell-shaped.*

= *Corolla 2-parted nearly to the base, the 2 lips sac-shaped or the lower larger one slipper-shaped: stamens only 2 (or very rarely 3), and no rudiments of more.*

11. CALCEOLARIA. Calyx 4-parted. The two sac-shaped or slipper-shaped divisions of the corolla entire or nearly so. Pod many-seeded. Leaves chiefly opposite, and flowers in cymes or clusters.

= = *Corolla almost 2-parted, the middle lobe of the lower lip folded together to form a flat pocket which encloses the 4 stamens and the style.*

12. COLLINSIA. Calyx deeply 5-cleft. Corolla turned down; its short tube laterally flattened, strongly bulging on the upper side: upper lip 2-cleft and turned back; the lower one larger and 3-lobed, its middle and laterally flattened pocket-shaped lobe covered above by the two lateral ones. A little rudiment of the fifth stamen present. Pod globular, with few or several seeds. Flowers on pedicels single or mostly clustered in the axils of the upper opposite (rarely whorled) leaves, which are gradually reduced to bracts, forming an interrupted raceme.

= = = *Corolla not 2-parted nor salver-shaped, but with a tube of some length in proportion to the 2-lipped or more or less irregular (rarely nearly regular) 4-5-lobed border, and*

a. *With a spur or sac-like projection at the base on the lower side, and a projecting palate to the lower lip, which commonly closes the throat or nearly so: stamens 4, and no obvious rudiment.*

13. LINARIA. Calyx 5-parted. Corolla personate, and with a spur at base. (Lessons, p. 102, fig. 211.) Pod many-seeded, opening by a hole or chink which forms below the summit of each cell.
14. ANTIRRHINUM. No spur, but a sac or gibbosity at the base of the personate corolla (Lessons, p. 102, fig. 210): otherwise like 13.

b. *Neither spur nor sac at base of the corolla, nor a projecting palate in the throat, nor with the upper lip laterally compressed or folded and narrow and arched.*

1. *Stamens with anthers 4, and no rudiment of the fifth: peduncles 1-flowered.*

15. MAURANDIA, including LOPHOSPERMUM. Herbs with alternate or partly opposite leaves, and solitary long-peduncled flowers in their axils, climbing by their coiling leafstalks and flowerstalks. Calyx 5-parted, foliaceous. Corolla open-mouthed, between bell-shaped and inflated-tubular, with 2 plaits or hairy lines running down the tube within, the border obscurely 2-lipped or oblique, but the 5 spreading roundish lobes nearly similar, the upper ones outermost in the bud. Pod as in 14.

16. DIGITALIS. Herbs with erect simple stem, alternate leaves, and a simple terminal raceme of hanging flowers. Calyx 5-parted, foliaceous, the upper sepal smallest. Corolla declining, with a long more or less inflated tube and a short scarcely spreading border, distinctly or indistinctly lobed, the lower lobe or side longest, the lateral ones outermost in the bud. Pod 2-valved, many-seeded.

17. GERARDIA. Herbs with branching stems, opposite or some alternate leaves, and above with single flowers in their axils or those of the bracts. Calyx 5-toothed or 5-cleft. Corolla inflated bell-shaped or tubular-funnel form, with an oblique or rather unequal border, the 5 lobes somewhat equal, the lower and lateral ones outside in the bud. Two pairs of stamens of quite unequal length. (Lessons, p. 95, fig. 194.) Pod globular or ovate, pointed, 2-valved, many-seeded.

18. SEYMERIA. Herbs, like 17; but corolla with a short and broad bell-shaped tube, not longer than the 5 ovate or oblong nearly equal spreading lobes; and the stamens almost equal, their anthers blunt at base.

19. MIMULUS. Herbs, with opposite leaves, and single flowers in the axils of the upper ones. Calyx prismatic, with 5 projecting angles, 5-toothed. Corolla tubular or funnel-form, 2-lipped, the upper lip of 2 rounded and recurved lobes, the lower of 3 rounded spreading lobes. Stamens included. Stigma of 2 flat lips. Pod 2-valved, many-seeded.

20. TORENIA. Trailing herbs, with opposite leaves and axillary flowers. Calyx prismatic, with sharp angles, 2-lipped at summit, the lips 2-toothed and 3-toothed. Corolla short-funnel-shaped or tubular with inflated throat, 4-lobed, the upper lobe (sometimes slightly notched) outermost in the bud. Filaments arched and their anthers brought together in pairs under the upper lobe, the longer pair almost equalling the upper lobe and bearing a short naked branch or appendage at base; the shorter pair simple and included. Stigma 2-lipped. Pod many-seeded.

2. *Stamens with good anthers only 2, a pair of sterile ones or abortive filaments generally present also: flowers small: calyx 5-parted: corolla 2-lipped: leaves opposite, with single flowers in the axil of the upper ones: peduncles simple and bractless.*

21. ILYSANTHES. Spreading little herbs. Upper lip of the short corolla erect and 2-lobed: the lower larger, spreading, 3-cleft. Upper pair of stamens with good anthers, included in the tube of the corolla; lower pair borne in the throat and protruded, 2-forked, without anthers. Stigma 2-lipped. Pod many-seeded.

22. GRATIOLA. Low herbs. Upper lip of the corolla either entire or 2-cleft; lower 3-cleft. Stamens included; the upper pair with good anthers; the lower pair short with rudiment of anthers or a mere naked filament, or none at all. Stigma 2-lipped. Pod many-seeded. A pair of bracts at the base of the calyx.

3. *Stamens with anthers 4, the fifth stamen present as a barren filament or a scale: calyx 5-parted or of 5 imbricated sepals: stigma simple: leaves chiefly opposite: flowers in the axils of the upper leaves, or when these are reduced to bracts forming a terminal panicle or raceme: peduncles few-flowered, or when one-flowered bearing a pair of bractlets, from the axils of which flowers may spring: pod many-seeded.*

23. SCROPHULARIA. Homely and rank erect herbs. Corolla small, with a globular or oval tube, and a short border composed of 4 short erect lobes and one (the lower) spreading or reflexed. Fertile stamens short and included; the rudiment which answers to the fifth is a little scale at the summit of the tube of the corolla.

24. CHELONE. Low upright smooth herbs, with flowers sessile in spikes or clusters in the axils of the upper leaves, and accompanied by closely imbricated concave roundish bracts and bractlets. Corolla short-tubular and inflated, concave underneath, with the 2 broad lips only slightly open; the upper arched, keeled in the middle, notched at the apex; the lower one woolly bearded in the throat and 3-lobed at the end. Filaments and anthers woolly: sterile filament shorter than the others. Seeds winged.

25. PENTSTEMON. Herbs (or a few shrubby at base), with mostly upright stems branching only from the base, and panicled or almost racemed flowers. Corolla tubular, bell-shaped, funnel-form, &c., more or less 2-lipped, open-mouthed. Sterile filament conspicuous, usually about as long as the anther-bearing ones. Seeds wingless.

26. RUSSELLIA. Rather shrubby spreading plants, or with pendulous angular branches; the flowers loosely panicled or racemed. Corolla tubular with 5 short spreading lobes, the 2 upper a little more united. Sterile filament small and inconspicuous near the base of the corolla. Seeds wingless.

c. *Neither spur nor sac at base of the corolla, the narrow laterally compressed or infolded upper lip of which is helmet-shaped or arched, entire or minutely notched, and enclosing the 4 stamens; no sterile filament. Often showy but uncultivable plants.*

27. CASTILLEIA. Herbs with simple stems, alternate leaves, some of the upper, with flowers chiefly sessile in their axils, colored like petals, and more gay than the corollas. Calyx tubular, flattened laterally, 2–4-cleft. Corolla tubular, with a long and narrow conduplicate erect upper lip, and a very short 3-lobed lower lip. Cells of the anther unequal. Pod many-seeded.

28. PEDICULARIS. Herbs with simple stems, chiefly pinnatifid leaves and spiked flowers. Corolla tubular, with a strongly arched or flattened helmet-shaped upper lip, and the lower erect at base, 2-crested above and 3-lobed. Seeds several in each cell.

29. MELAMPYRUM. Low herbs with branching stems, opposite leaves, and flowers in their axils, or the upper crowded in a bracted spike. Calyx bell-shaped, 4-cleft, the lobes taper-pointed. Corolla tubular, enlarging above, with the lower lip nearly equalling the narrow upper one and its biconvex palate appressed to it, 3-lobed at the summit. Cells of the anther minutely pointed at base. Pod oblique, with only 2 seeds in each cell.

1. BRUNFÉLSIA. (Named for the old herbalist, *Otto Brunfels.*) Conservatory shrubs, from Brazil, cult. under the name of FRANCÍSCEA; with showy flowers, blue or violet turning paler.

B. latifòlia, is very smooth, with oval or oblong leaves, and few flowers at the end of the branches 1½′ across.

B. Hopeàna, with lance-oblong leaves 2′ long, and flower only 1′ wide.

2. BROWÁLLIA. (Named for *Dr. Browall*, of Sweden, first a friend, later a bitter opponent of Linnæus.)

B. demissa (named also B. ELÀTA when the plant and the man it was named for grew exalted), from S. America; cult. in the gardens, 1°–2° high, bushy-branched, with ovate leaves and handsome bright violet-blue flowers (1′ or less across, at length as it were racemed) produced all summer. ①

3. SALPIGLÓSSIS. (Greek for *trumpet-tongue*, from the curved apex of the style with dilated stigma likened to the end of a trumpet.

1. S. sinuàta. Cult. from Chili as an ornamental annual or biennial, under various names and varieties according to the color of the large flowers, dark-purple, or straw-colored and mostly striped: fl. all summer. In appearance resembles a Petunia.

4. SCHIZÁNTHUS. (Greek for *cut flower*, the corolla being as if cut into slips.) Cult. for ornament, from Chili: fl. summer. ①

S. pinnàtus, the common species, of several varieties; slender, 1°–2° high, pubescent with fine glandular hairs, with leaves once or twice pinnate or parted into narrow divisions, and numerous handsome flowers barely 1′ in diameter,

usually pink and white variegated with yellowish and some deeper purple spots on the larger lobe. — There are one or two larger flowered but less common species.

5. PAULÓWNIA. (Named for a Russian Princess.) Only one species.

P. imperiàlis, of Japan, cult. for ornament, scarcely hardy far N.; the heart-shaped very ample leaves resembling those of Catalpa but much more downy, flowers in large terminal panicle, in spring, the violet corolla 1½′ – 2′ long.

6. VERBÁSCUM, MULLEIN. (Ancient Latin name.) Natives of the Old World, here weeds, often hybridizing: fl. summer. ♃ ②

V. Thápsus, COMMON M. Fields: densely woolly, the tall simple stem winged from the bases of the oblong leaves, bearing a long dense spike of yellow (rarely white) flowers.

V. Lychnìtis, WHITE M. Waste places, rather scarce: whitened with thin powdery woolliness, the stem not winged, ovate leaves greenish above, and spikes of yellow or rarely white flowers panicled.

V. Blattària, MOTH M. Roadsides: green and smoothish, 2° – 3° high, slender, with ovate toothed or sometimes cut leaves, and loose raceme of yellow or else white and purplish-tinged flowers.

7. CÉLSIA. (Named for *O. Celsius*, a Swedish Orientalist.) Fl. summer.

C. Crètica, cult. for ornament from the Mediterranean region: 2° – 3° high, rather hairy, or the raceme clammy, with lower leaves pinnatifid, upper toothed and clasping at base, corolla orange-yellow with some purple (1′ – 2′ across), lower pair of filaments naked, the upper pair short and woolly-bearded. ②

8. ALONSÒA. (Named for *Alonzo Zanoni*, a Spanish botanist.) Cult. as annuals, from South America: fl. all summer.

A. incisæfòlia (also called URTICÆFÒLIA): smoothish, branching, 1° – 2° high, with lance-ovate or oblong sharply cut-toothed leaves, and orange-scarlet corolla less than 1′ wide: several varieties.

9. VERÓNICA, SPEEDWELL. (Name of doubtful derivation, perhaps referring to *St. Veronica*.) Fl. summer.

§ 1. *Shrubby, tender, very leafy species, from New Zealand, with entire and glossy smooth and nearly sessile evergreen leaves, all opposite, dense many-flowered racemes from the axils, and acutish pods.*

V. speciòsa, is smooth throughout, with obovate or oblong blunt or retuse thick leaves, and very dense spike-like racemes of violet-purple flowers.

V. salicifòlia, has lanceolate acute leaves, and longer clammy-pubescent racemes of blue flowers.

V. Lindleyana, has oblong-lanceolate pale leaves, and racemes of pale lilac flowers.

§ 2. *Herbs, growing wild, or those of the first subdivision cultivated in gardens.*

* *Spikes or dense spike-like racemes terminating the erect stem or branches and often clustered.* ♃

V. spicàta, and sometimes V. PANICULÀTA, or hybrids between them, are cult. for ornament, from Eu.: 9′ – 2° high, with opposite lanceolate toothed leaves, lobes of mostly blue corolla much longer than the distinct tube, and pod notched at the end.

V. Virgínica, CULVER'S ROOT. Wild in rich woods from Vermont W. & S.; remarkable for the tube of the small whitish corolla longer than the acutish lobes and much longer than the calyx; simple stems 2° – 6° high, bearing whorls of lanceolate or lance-ovate pointed finely serrate leaves; spikes dense and clustered.

** *Racemes in the axils of the opposite leaves; stems creeping or procumbent at base, but above ascending: corolla, as in all the following, strictly wheel-shaped.* ♃

WATER SPEEDWELLS or BROOKLIME, *in water or wet ground, smooth and with pale blue (sometimes darker striped) flowers on slender spreading pedicels.*

V. Anagállis. In water N.: leaves lance-ovate acute, sessile by a heart-shaped base, 2′–3′ long; pod slightly notched, many-seeded.

V. Americàna. In brooks, much more common; leaves mostly petioled, ovate or oblong, serrate; flowers on more slender pedicels; and pod more turgid than in the foregoing.

V. scutellàta. In bogs N.; slender, with linear slightly toothed sessile leaves, only 1 or 2 very slender zigzag racemes, few long-pedicelled pale flowers; and very flat pod deeply notched at both ends, broader than long, few-seeded.

+ + *In dry ground, pubescent, with light blue flowers in spike-like racemes.*

V. officinàlis, COMMON SPEEDWELL. Spreading or creeping, low; leaves wedge-oblong or obovate, serrate, short-petioled; pedicels shorter than calyx; pod wedge-obcordate, several-seeded.

*** *Raceme loose, terminating the leafy low stem or branches, or the small flowers in the axils of the gradually decreasing leaves.*

V. serpyllifòlia, THYME-LEAVED S. Creeping or spreading on the ground; with simple flowering stems ascending 2′–4′, smooth; leaves roundish, small, almost entire; corolla pale blue or whitish with darker stripes, longer than the calyx. ♃

V. peregrina, NECKWEED or PURSLANE-S. Common weed in damp waste or cult. ground; smooth, erect, branching, with lower leaves oval or oblong and toothed, the upper oblong-linear and entire, inconspicuous flowers almost sessile in their axils, whitish corolla shorter than the calyx, and many-seeded pod slightly notched. ①

V. arvénsis, CORN S. Introduced into waste and cult. grounds E.; hairy, 3′–8′ high, with lower leaves ovate and crenate, on petioles, the upper sessile lanceolate and entire, blue flowers short-peduncled, and pod obcordate. ①

10. BÚCHNERA, BLUE-HEARTS. (Named for one *Buchner*, an early German botanist.) Flowers summer. ♃

B. Americàna. Sandy or gravelly plains, from New York W. & S.; rough-hairy, turning blackish in drying; with slender stem 1°–2½° high, veiny leaves coarsely few-toothed, the lowest obovate, middle ones oblong, uppermost lance-linear, flowers scattered in the slender spike, and corolla deep purple.

11. CALCEOLÀRIA. (From Latin *calceolus*, a shoe or slipper.) Tender South American herbs or shrubs, with curious and handsome flowers, cult. as house and bedding plants. The common cultivated species are now for the most part too much mixed and crossed for botanical analysis.

C. integrifòlia (also called RUGÒSA and SALVIÆFÒLIA) is the commonest woody-stemmed species, with oblong leaves rugose in the manner of Garden Sage, and small yellow or orange flowers in crowded clusters.

C. corymbòsa, herbaceous, hairy or clammy-pubescent, with ovate crenate-toothed leaves nearly all at the root, and loose corymbs or cymes of yellow flowers, the purple-spotted mouth considerably open.

C. crenatiflòra, a fertile parent of many of the more showy herbaceous garden forms, with more leafy stems and larger flowers, their orifice rounder and smaller, the hanging lower lip or sac 1′ or more long, more obovate and flat, somewhat 3-lobed as it were towards the end, and variously spotted with purple, brown, or crimson.

C. scabiosæfòlia is a delicate annual, with pinnately divided slightly hairy leaves, on petioles dilated and connate at base, and loose small pale yellow flowers with globular lower lip about ½′ wide.

12. COLLÍNSIA. (Named by Nuttall for the late *Zaccheus Collins* of Philadelphia.) Flowers handsome, mostly 2-colored. ① ②

C. vérna. *Wild* from Western New York W.: slender, 6′ – 20′ high, with ovate or lance-ovate and toothed leaves, the upper clasping heart-shaped, and slender-peduncled flowers in early spring, lower lip blue, upper white.

C. bicolor, of California, and a handsome garden annual, is stouter, with crowded flowers as if whorled, pedicels shorter than calyx, lower lip of corolla violet, the upper pale or white, or in one variety both white.

13. LINÀRIA, TOAD-FLAX. (Name from *Linum*, Flax, from resemblance in the leaves of the commoner species.) Fl. summer.

* *Leaves narrow, sessile, and entire: stems erect: flowers racemed.*

L. Canadénsis, WILD T. Gravelly and sandy ground, with scattered linear leaves on the slender flowering stems, or oblong and in pairs or threes on prostrate shoots, and very small blue flowers. ① ②

L. vulgàris, COMMON T., RAMSTED, BUTTER-AND-EGGS. A showy but troublesome European weed, of fields and roadsides, 1° – 3° high, with alternate crowded linear or lanceolate pale leaves, and a dense raceme of yellow flowers (1′ long) with paler tips. ♃

L. triornithóphora. Cult. from Europe: glaucous, 2° – 3° high, with ovate-lanceolate leaves in whorls, and rather large slender-peduncled long-spurred flowers, violet and purple-striped. ♃

* * *Leaves broad, often lobed: stems and branches trailing: flowers very small, yellow and purple mixed, on long axillary peduncles: natives of Europe.*

L. Elátine. Nat. in gravelly or sandy soil: hairy, with ovate and halberd-shaped short-petioled leaves, the lower ones opposite. ①

L. Cymbalària. Cult. as a delicate little trailing ornamental plant: very smooth, pale, with rooting branches, and thickish almost kidney-shaped 3 – 5-lobed leaves on long petioles. ♃

14. ANTIRRHÌNUM, SNAPDRAGON. (Name from the Greek, compares the flower with the snout or muzzle of an animal.) Nat. and cult. from Europe: fl. summer.

§ 1. TRUE SNAPDRAGON, *with palate closing the mouth of the corolla, and erect or ascending stems, not climbing.*

A. màjus, LARGE S. of the gardens; with stems 1° – 3° high, oblong or lanceolate entire smooth leaves, and glandular-downy raceme of showy flowers, the crimson, purple, white, or variegated corolla over 1′ long. ♃

A. Oróntium, SMALL S. Weed in some old gardens and cult. grounds; low, slender, with linear leaves, and white or purplish axillary flowers ½′ long. ①

§ 2. MAURANDIA-LIKE S., *with palate not so large, nor fully closing the mouth, and stems climbing by the coiling of their slender petioles and sometimes of the peduncles also.*

A. maurandioides, cult. from Texas and Mexico, as MAURÁNDIA ANTIRRHINIFLÒRA; smooth, with triangular-halberd-shaped leaves, or some of them heart-shaped, and showy flowers in their axils, the violet or purple corolla 1′ or more long. ♃

15. MAURÁNDIA. (Named for *Prof. Maurandy.*) Excluding the last preceding species, which has the flower of Snapdragon, and including LOPHOSPERMUM, which has wing-margined seeds. Mexican climbers, with triangular and heart-shaped or halberd-shaped and obscurely lobed leaves, tender, cult. for ornament: fl. all summer.

§ 1. *Corolla naked inside, rather obviously 2-lipped.*

M. Barclayàna. Stems and leaves smooth; calyx glandular-hairy, clammy, its divisions lance-linear; corolla purple, usually dark, 2′ or more long.

M. semperflòrens, has lanceolate smooth calyx-divisions, and smaller rose-purple or violet corolla.

§ 2. LOPHOSPÉRMUM. *Corolla very obscurely 2-lipped, and with 2 bearded lines.*

M. erubéscens. Somewhat soft-pubescent, with irregularly toothed leaves, rose-colored flowers 3′ long, and ovate-oblong rather leaf-like sepals

M. scándens, now less common and not so showy, is less pubescent, and has smaller less-inflated deeper purple corolla, and lance-oblong sepals.

16. DIGITÀLIS, FOXGLOVE. (Latin name, from shape of the corolla, likened to the finger of a glove, in the common species.)

D. purpùrea, PURPLE F., of which varieties with corolla white or pale and more or less strongly spotted corolla are common, 2′ long, the lobes rather obscure; leaves rugose, somewhat downy. Cult. from Eu.: fl. summer. ♃

17. GERÁRDIA. (Named for the herbalist, *Gerarde.*) Handsome, but uncultivable plants: fl. late summer and autumn. The following are the commonest wild species: mostly of gravelly or sandy soil.

§ 1. *Corolla purple or rose-color, somewhat bell-shaped: calyx-teeth short: anthers all alike, nearly pointless at base: leaves narrow, linear or thread-shaped, entire: loosely branching, nearly all annuals, except the first.*

G. linifòlia. Pine-barrens S.; with erect branches, and erect linear leaves about the length of the peduncles, truncate calyx, and corolla 1′ long. ♃

G. tenuifòlia. N. & S.; with opposite pedicels equalling the linear spreading leaves, broadly awl-shaped calyx-teeth, and corolla ½′ – ⅓′ long.

G. filifòlia. S.; with alternate pedicels twice the length of the rather fleshy thread-shaped or slightly club-shaped leaves; corolla ¾′ long.

G. aphýlla. S.; with short pedicels alternate along one side of the flowering branches, and minute scale-like or awl-shaped appressed leaves, minute calyx-teeth, and corolla ½′ long.

G. purpùrea. N. & S. in low ground; with stout pedicels not longer than the conspicuously 5-lobed calyx, opposite and spreading rather broad linear leaves, and corolla ¾′ – 1′ long.

G. marítima. Salt marshes N. & S., lower than the preceding, and with fleshy blunt leaves, the pedicels as long as the upper ones and as the obtusely 5-toothed calyx, and corolla ½′ – ¾′ long.

§ 2. *Corolla purple (or sometimes white): calyx deeply and unequally 5-cleft: anthers pointless, those of the shorter pair much smaller: leaves rather broad.*

G. auriculàta. Low grounds, from Penn. S. & W.; rough-hairy, with nearly simple stem, lanceolate or oblong leaves entire, or the lower with a lobe on each side of the base; flowers sessile in the upper axils; corolla 1′ long.

§ 3. *Corolla yellow and with a longer tube, the inside woolly, as are the filaments and anthers; the latter almost projecting, slender-pointed at base: calyx 5-cleft: taller herbs, with leaves or some of them pinnatifid or toothed.* ♃

* *Stems nearly simple: flowers in a leafy raceme: corolla more tubular.*

G. flàva, DOWNY FALSE FOXGLOVE. Open dry woods: 3° – 4° high, minutely soft-downy; upper leaves lanceolate or oblong and entire, lower sinuate or pinnatifid; pedicels very short; corolla 1½′ long.

G. quercifòlia, SMOOTH F. Rich woods, commoner S. & W.: 3° – 6° high, smooth and glaucous; upper leaves often entire, lower once or twice pinnatifid; pedicels as long as calyx; corolla 2′ long.

G. integrifòlia. Barrens, from Penn. S. & W.: 1° – 2° high, smooth, not glaucous; leaves lanceolate, entire; corolla 1′ long.

* * *Stems bushy-branched: calyx-lobes toothed or pinnatifid: leaves mostly cut.*

G. grandiflòra. Oak openings from Wisconsin S.: 3° – 4° high, minutely downy; leaves ovate-lanceolate, coarsely cut-toothed, the lower pinnatifid; pedicels shorter than the barely toothed calyx-lobes; corolla 2′ long.

G. pediculària. Common N. & S.: slightly pubescent, 2° – 3° high, very leafy; leaves all pinnatifid and the lobes cut-toothed; pedicels opposite and longer than the hairy serrate calyx-lobes; corolla over 1′ long.

G. pectinàta. Sandy barrens S.: more hairy than the foregoing, with finer divided leaves, alternate pedicels shorter than pinnatifid calyx-lobes; corolla broader and 1½′ long.

18. SEYMÈRIA. (Named for *Henry Seymer.*) Wild plants S. & W., very near Gerardia: flowers yellow, in summer and autumn.

S. macrophýlla, MULLEIN-FOXGLOVE. Shady river-banks W.: 4° – 5° high, with large leaves, the twice or thrice pinnately divided or cut, the upper lanceolate and toothed; curved corolla woolly inside, also the filaments; style short. ♃

S. pectinàta. Sandy ground S.: about 1° high, branchy, clammy-pubescent; pinnatifid leaves with oblong-linear lobes; corolla ½′ long. ①

S. tenuifòlia. Low sandy grounds S.: 2° – 4° high, with long slender branches; leaves pinnately divided into thread-shaped divisions; corolla hardly ½′ long. ①

19. MÍMULUS, MONKEY-FLOWER. (From Greek *for an ape,* from the grinning corolla.) Fl. all summer.

* *Wild in wet places, with erect square stem* 1° – 2° *high, oblong feather-veined serrate leaves, and violet-purple corolla* (1′ *or so in length*). ♃

M. ríngens, the commonest, with clasping leaves, peduncles longer than the flower, and taper-pointed calyx-teeth.

M. alàtus, not rare more S., has leaves tapering into a petiole, peduncle shorter than calyx and short-toothed, and sharp wing-like angles to stem; whence the name.

* * *Cult. for ornament, chiefly in conservatories, from Western N. America.*

M. glutinòsus, shrubby conservatory plant from California, glutinous-pubescent, with oblong or lanceolate leaves, and large yellow orange or brick-red flower.

M. cardinàlis. Erect, clammy-pubescent; leaves wedge-oblong, partly clasping, several-nerved; flowers large, brick-red. ♃

M. lùteus. Erect, smooth; leaves ovate or cordate-clasping, several-nerved; flowers showy, yellow, often spotted with rose or brown; of many varieties. ♃

M. moschàtus, MUSK-PLANT. Weak and diffuse, rooting, clammy-villous, smelling strong of musk; leaves ovate or oblong; flower small, pale yellow. ♃

20. TORÈNIA. (Named for *O. Toren,* an obscure Swedish botanist.)

T. Asiàtica, cult. from India, a handsome hothouse plant, with lance-ovate serrate leaves, wing-angled calyx, and corolla over 1′ long, pale violet or purple with the tube and the end of the 3 rounded lower lobes dark violet.

21. ILYSÁNTHES, FALSE PIMPERNEL. (From Greek words for *mire* and *flower,* alluding to the station.) Fl. all summer.

I. gratioloìdes. Common in wet places, a smooth diffuse little plant, 4′ – 8′ high, with rounded or oblong leaves, and small purple or bluish flowers. ①

22. GRATÌOLA, HEDGE-HYSSOP. (Old name, from Latin *gratia,* grace.) Rather insignificant plants, in low or wet places: flowering all summer. ① ♃

* *Sterile filaments minute or hardly any: corolla whitish, with yellowish tube.*

G. Virginiàna. Rather clammy, with lanceolate leaves and slender peduncles.

G. sphærocárpa. Chiefly S.: smooth and stouter, with lance-ovate leaves, peduncles scarcely longer than the calyx, and larger spherical pod.

* * *Sterile filaments obvious, usually tipped with a little glandular head in place of the anther: leaves short.*

G. viscòsa. Chiefly S. W.: clammy, with lance-oblong toothed leaves shorter than the peduncles, and whitish flowers.

G. aùrea. Sandy wet soil, E. & S.: nearly smooth, with rather narrow entire leaves as long as the peduncles, and golden yellow flowers.

G. pilòsa. From N. Jersey S.: very different from any of the foregoing, having rigid and simple erect stems and ovate or oblong sessile leaves, both hairy, the flowers sessile, the white corolla hardly longer than the calyx.

23. SCROPHULÀRIA, FIGWORT. (Plants a supposed remedy for *scrofula.*) These homely and insignificant plants hardly ought to have given the name to this large and important family.

S. nodòsa. Damp shady ground: smooth, with 4-sided stem 3° – 4° high, ovate or oblong coarsely toothed leaves, and small lurid flowers in loose cymes, all summer. ♃

24. CHELÒNE, TURTLE-HEAD (to which the name, from the Greek, refers), SNAKE-HEAD, BALMONY.

C. glàbra, the common species, of wet places; 1° – 2° high, with lanceolate or lance-oblong leaves on very short petioles, and white or pale purple corolla 1′ or more long, all summer. ♃

25. PENTSTÈMON. (Name, from the Greek, meaning 5 stamens, refers to the presence of the 5th stamen, which, however, has no anther.) Showy North American and a few Mexican plants, chiefly Western; two or three are wild E.; several are in choice cultivation, but few are yet common here. Fl. late spring and summer. ♃

* *Wild E. of the Mississippi, and sometimes cult.: flowers white, commonly tinged with some purplish or violet: leaves partly clasping, often serrate: panicle clammy, the corolla slightly so.*

P. pubéscens. Somewhat clammy-pubescent, or smoothish except the panicle, 1° – 3° high, variable; stem-leaves lanceolate; flowers nodding; the plainly 2-lipped corolla (1′ long) with gradually enlarging tube concave on the lower, convex on the upper side, a sort of palate almost closing the mouth; sterile filament yellow-bearded down one side.

P. Digitàlis. N. Virginia to Ill. & S.: taller (2° – 4°), smooth up to the naked panicle, with wider more entire leaves; corolla but slightly 2-lipped, open, abruptly inflated bell-shaped above from a narrow tube; sterile filament sparingly bearded on one side.

* * *Wild beyond but near the Mississippi, showy and cultivated for ornament.*

P. grandiflòrus. Plains from Falls of St. Anthony W. & S. W.: very smooth, pale and glaucous, 1° – 3° high, with thick ovate leaves (1′ – 2′ long) closely sessile and entire, the upper ones rounded, short-pedicelled flowers racemed, lilac-purple oblong-bell-shaped corolla 1½′ – 2′ long and almost equally 5-lobed, the sterile filament nearly smooth.

P. Cobæa. Plains from Nebraska S.: 1° – 2° high, stout, with ovate often denticulate thick leaves, a slightly clammy few-flowered panicle or raceme, pale purplish or whitish corolla about 2′ long and abruptly much inflated above the narrow base, the border 2-lipped, but the oblong lobes similar; the sterile filament bearded.

P. glàber. Plains from Nebraska and Missouri W.: very smooth, commonly pale or glaucous, with ascending stems 1° – 2° long, lanceolate or lance-ovate, entire leaves, and a narrow panicle of very handsome flowers; the tubular-inflated corolla about 1½′ long, bright purple blue, with the spreading lobes of the 2 short lips similar; sterile filaments and also the anthers slightly hairy or else naked.

* * * *Farther Western species, cultivated and hardy in the gardens.*

P. ovàtus, of Oregon, is an early blue-flowered species, smoothish, with ovate or lance-ovate serrate leaves, and open panicle of small flowers.

P. barbàtus, supposed to come from Mexico, long cult. in the gardens; smooth, with slender wand-like stems 3° – 4° high, lanceolate and entire pale leaves, long and loose raceme or panicle of drooping flowers, narrow tubular scarlet corolla over 1′ long, with erect upper lip concave and slightly 2-lobed, the lower parted into 3 reflexed or spreading oblong lobes, some beard in the throat, and sterile filament naked. Var. TORREYI, from New Mexico and Rocky Mountains, is taller, the brighter red corolla with little or no beard in the throat.

* * * * *Common garden species from Mexico, but not hardy N., are forms of*

P. Hartwègi. Smooth: leaves lanceolate, entire, the upper broader at the base and clasping; peduncles elongated, 3-flowered; corolla 2′ long, deep red or red purple, the border almost equally 5-cleft; sterile filament naked.

P. campanulàtus. Smooth: leaves lanceolate, acuminate, sharply serrate, the base clasping; flowers in a raceme-like one-sided panicle; corolla ventricose above, reddish-purple or rose-colored; sterile filament bearded. Varies greatly in cultivation.

26. RUSSÉLLIA. (Named for *Dr. Alexander Russell* of Scotland.) ♃

R. júncea, of Mexico, a showy house and bedding plant; very smooth, with small lance-ovate or linear, or else reduced to little scales on the copious long and rush-like green hanging branches and branchlets; corolla 1′ long, narrow, bright carmine red.

27. CASTILLÈIA, PAINTED-CUP. (Named for *Castillejo*, a Spanish botanist.) There are several showy species on the plains from beyond the Mississippi to the Pacific. Fl all late spring and summer.

C. coccínea, SCARLET P. Sandy low grounds; pubescent, simple-stemmed, 1° – 2° high, with stem leaves cut-lobed, those next the flowers 3-cleft, their dilated and cut-toothed lobes brilliant scarlet, while the 2-cleft calyx is yellowish and the narrow corolla pale yellow. ① ②

28. PEDICULÀRIS, LOUSEWORT (which the name denotes). ♃

P. Canadénsis, COMMON P. or WOOD-BETONY. Low, rather hairy, with alternate leaves, the upper pinnatifid, lower pinnate, a short dense spike of greenish and purplish flowers, oblique calyx without lobes but split down in front, and a dagger-shaped pod: fl. spring.

P. lanceolàta. Less common, in swamps; 1° – 3° high, smoothish, with lance-oblong leaves doubly cut-toothed, some of them opposite, a close spike of pale yellow flowers, 2-lobed leafy-crested calyx, and ovate pod: fl. late summer.

29. MELAMPÝRUM, COW-WHEAT. (The name in Greek means *black grain*, from the color of the seeds.) ①

M. Americànum, our only species, common in open woodlands; 6′ – 12′ high, with lanceolate leaves, the upper ones abrupt or truncate at base and with a few bristle-tipped teeth, the scattered flowers pale yellowish or almost white, sometimes purplish-tinged; produced all summer.

77. ACANTHACEÆ, ACANTHUS FAMILY.

Plants with opposite simple leaves, 2-lipped or otherwise irregular or even regular monopetalous corolla, 4 didynamous or else only 2 stamens, 2-celled ovary and pod, and few seeds, — distinguished from the related orders by the seeds without albumen and borne on hook-like projections of the placentæ or on a sort of cup. Chiefly a tropical family; many in choice conservatories, here omitted.

§ 1. *Twining tropical herbs (or cult. as herbs), with nearly regular 5-lobed corolla, and globular seeds supported by a cartilaginous ring or shallow cup.*

1. THUNBERGIA. Flowers enclosed when in bud by a pair of large leaf-like bractlets borne below the short cup-shaped calyx. Corolla with a mostly somewhat curved tube and an abruptly wide-spreading border of 5 rounded equal lobes, convolute in the bud. Stamens 4, included. Pod globular, tipped with a long and conspicuous flattened beak, 2–4-seeded. Peduncles axillary, 1-flowered.

§ 2. *Erect or spreading: all the following are herbs, with flat seeds borne on hook-like processes (retinacula): calyx 4–5-parted, mostly 2-bracted.*

2. ACANTHUS. Corolla of one 3-lobed lip, the upper lip wanting. Stamens 4, with one-celled ciliate anthers. Leaves pinnatifid. Flowers in a spike.
3. RUELLIA. Corolla funnel-form, with an almost equally 5-lobed spreading border, convolute in the bud. Stamens 4, included: cells of the anthers parallel. Pod narrow, contracted into a stalk-like base, above 4–12-seeded.
4. DICLIPTERA. Corolla 2-lipped, the lower lip 3-lobed, the upper 2-cleft or entire; but the flower as it were reversed so that the 3-lobed lip seems to be the upper one. Stamens 2, protruded: cells of the anther equal, but one placed below the other. Pod 2–4-seeded below the middle.
5. DIANTHERA. Corolla 2-lipped, the upper lip erect and notched; the lower 3-lobed, wrinkled or veiny towards the base, spreading. Stamens 2: cells of the anther one below the other, mostly unequal. Pod flattened above, contracted into a stalk-like base, 4-seeded above the middle.

1. THUNBÉRGIA. (Named from the Swedish botanist *Thunberg.*) Showy flowers produced all summer.

T. alàta (so named from its winged petioles) from Africa, is the one commonly cultivated (as an annual) in many varieties as to size and color of flower, buff, orange, white, &c., usually with blackish-purple eye; herbage soft-downy or hairy; leaves between heart-shaped and arrow-shaped. ♃

2. ACÁNTHUS. (Old Greek and Latin name, from the word for *spine* or *prickle.*) ♃

A. móllis, one of the classical species, from S. Eu., is occasionally cult., not hardy N.: the broad sinuately and deeply pinnatifid leaves mostly from the root, hardly at all prickly; flowers on a short scape, dull-colored.

3. RUÉLLIA. (Named for the herbalist *Ruelle.*) Ours are wild herbs, chiefly southern, with purple or blue showy flowers, mostly in clusters, produced all summer. ♃

§ 1. *Cells of the anther pointed at base: stigma only one: pod 4-seeded.*

R. oblongifòlia. Pine barrens S.: downy, 6′–12′ high from a creeping base, with nearly sessile oval leaves barely 1′ long, almost bristle-shaped sepals, but oblong bracts, and spotted purple corolla 1′ long.

§ 2. *Cells of the anther blunt: stigmas 2: pod 8–12-seeded: stems 1°–4° high.*

R. ciliòsa. Dry soil W. & S.: clothed with soft white hairs, the oval or oblong leaves nearly sessile, pale blue corolla (about 2′ long) with slender tube much longer than the inflated upper part and than the bristle-shaped sepals.

R. strèpens. Richer soil, from Penn. W. & S.: smooth or slightly downy, with obovate or oblong leaves (1′–4′ long) narrowed into a petiole, and purple-blue corolla (1′–2′ long) with tube hardly longer than the expanded portion or than the linear-lanceolate sepals.

4. DICLÍPTERA. (Greek words for *double, shut,* from the 2-valved pod.)

D. brachiàta, of low banks S. is nearly smooth, with 6-angled stem bearing many branches, thin ovate-oblong pointed leaves on slender petiole, and interrupted spike-like clusters of small purple flowers, each with a pair of conspicuous flat bracts. ♃

5. **DIANTHÈRA.** (From Greek for *double anther*, alluding to the two separated cells on each filament.) Fl. all summer. ♃

D. ovàta. Muddy banks of streams S.: 4′–8′ high, smooth, with lance-ovate short-petioled leaves longer than the 3–4-flowered peduncles in their axils, and small pale purple flowers.

D. Americàna. Wet borders of streams: 2° high, smooth, with long linear-lanceolate leaves, and long peduncles (4′–6′ long) bearing an oblong spike of pale purple flowers.

78. VERBENACEÆ, VERVAIN FAMILY.

Plants with opposite (or sometimes whorled) leaves, differing from the other orders with irregular monopetalous and didynamous or tetrandrous flowers by the ovary not 4-lobed and with a single ovule in each of its (1–4) cells, the fruit either fleshy or when dry at length splitting into as many 1-celled indehiscent nutlets.

Besides the following some species of CLERODENDRON are cultivated, in choice conservatories.

§ 1. *Flowers in heads, spikes, or racemes, the flowers expanding from below upwards.*

1. PHRYMA. Flowers in slender loose spikes. Calyx cylindrical, 2-lipped, the upper lip of 3 slender-pointed teeth, the lower short and 2-toothed. Corolla tubular, 2-lipped, the upper lip notched, lower larger and 3-lobed. Stamens included. Ovary 1-celled, forming a simple akene in the calyx. Herb.
2. VERBENA. Flowers in spikes or heads. Calyx tubular or prismatic, 5-ribbed and plaited. Corolla salver-form, the tube often curved, the border rather unequally 5-cleft. Stamens included: upper pair sometimes wanting the anthers. Ovary 4-celled, at maturity splitting into 4 dry akenes or nutlets. Herbs.
3. LIPPIA. Flowers in heads, spikes, or racemes. Calyx tubular, 2–5-toothed. Corolla tubular, with 5-lobed 2-lipped border, the lower 3-lobed lip larger. Stamens included. Ovary and dry fruit 2-celled, 2-seeded.
4. LANTANA. Flowers in heads or short spikes. Calyx minute, obscurely 4-toothed. Corolla with an unequal 4-cleft spreading border, the upper lobe sometimes notched. Stamens included. Ovary 2-celled, becoming berry-like, and containing 2 little stones or nutlets. Shrubs or herbs.

§ 2. *Flowers nearly regular, in cymes from the axils of the simple leaves: shrubs.*

5. CALLICARPA. Calyx 4–5-toothed, short. Corolla tubular-bell-shaped, short, 4–5-lobed. Stamens 4, protruded, nearly equal. Ovary 4-celled, in fruit berry-like, with 4 little stones.

§ 3. *Flowers irregular, in cymes or clusters in the axils of the compound digitate leaves or of the upper leaves reduced to bracts: shrubs or trees.*

6. VITEX. Calyx 5-toothed. Corolla tubular, with a spreading 2-lipped border, the lower lip 3-parted and rather larger than the 2-lobed upper lip. Stamens 4, protruded, as is the style. Ovary 4-celled, becoming berry-like in the fruit, which contains a single 4-celled stone.

1. **PHRỲMA,** LOPSEED. (Name of unknown meaning.) One species.

P. Leptostàchya. Copses, &c.; 2°–3° high, with coarsely-toothed ovate thin leaves, and branches terminated by the slender spikes of very small purplish flowers, in summer, the pedicels reflexed in fruit. ♃

2. **VERBÈNA,** VERVAIN. (Latin name of some sacred herbs.) Fl. all summer. — Genus of difficult analysis on account of numerous hybrids, both wild and in cultivation.

§ 1. VERVAINS *native to the country, or growing as wild weeds, mostly in waste or cultivated ground; the flowers insignificant, in slender spikes; no appendage at tip of the anthers. All but the last with upright stems.* ♃

V. angustifòlia, NARROW-LEAVED V. Stems 6′–18′ high; leaves nar-

row lanceolate, sessile, roughish, slightly toothed; spikes few, thickish, crowded with purple flowers.

V. stricta, Hoary V. Barrens W. & S.: whitish-hairy, 1° - 2° high; leaves obovate or oblong, serrate, sessile; spikes thick and dense; flowers blue, larger than in the others.

V. hastàta, Blue V. Stem 4° - 6° high; leaves lance-oblong, some of the larger with short side lobes at base, cut-serrate, petioled; spikes densely-flowered, corymbed or panicled; flowers blue.

V. urticifòlia, Nettle-leaved or White V. Stem 4° - 6° high; leaves oval or oblong-ovate, coarsely serrate, petioled; spikes of small white flowers slender and loose.

V. officinàlis, European V. Nat. by roadsides, at least S. Stems 1° - 3° high, branched; leaves sessile, 3-cleft and mostly pinnatifid into narrow cut-toothed lobes; small purplish flowers in very slender panicled spikes.

V. bracteòsa. From Wisconsin S.; hairy, spreading or procumbent; leaves wedge-shaped or lance-oblong, cut-pinnatifid or 3-cleft, short-petioled; small purple flowers in solitary loose spikes, the lower ones leafy-bracted.

§ 2. Verbenas *of the garden sort, with creeping or spreading stems, and dense spikes of larger or showy flowers: anthers of the longer stamens with a gland-like tip.* ♃ ①

V. Aublètia. Wild from Ill. and Carolina W. & S.: has cut-pinnatifid leaves, and a long-peduncled spike of purple flowers, minutely bearded in the throat. — This and the several following species from South Brazil, Buenos Ayres, &c., variously and greatly mixed, make up the Verbenas which adorn our gardens in summer.

V. chamædrifòlia, the original Scarlet V., with oblong-lanceolate coarsely serrate leaves, nearly all sessile, and most intense red or scarlet flowers, in a flat cluster.

V. phlogiflòra, also named Tweediàna. More upright; the leaves decidedly petioled; the flowers inclined to form an oblong spike, and crimson, varying to rose, but not to scarlet.

V. incìsa, differs from the last in the pinnatifid-incised leaves, the petioled ones with a heart-shaped base; flowers in a flat cluster, rose-color or purple.

V. teucroìdes. Erect or spreading, with ovate-oblong and incised sessile leaves, and a lengthened spike of white or pale rosy flowers, sweet-scented, especially at nightfall.

V. erinoìdes, or multífida. Dwarf and much creeping, rough-hairy, with leaves pinnatifid into linear divisions, and originally with violet purple flowers, and

V. pulchélla or ténera, with equally finely cut leaves, and rather larger originally rose-violet flowers, are part parents of the smaller races.

3. LÍPPIA. (Named for *A. Lippi*, an Italian botanist.) Fl. late summer.

L. lanceolàta, Fog-fruit. A creeping weedy herb, along river-banks from Penn. S. & W., with wedge-spatulate or oblanceolate leaves serrate above the middle, and slender peduncles from the axils bearing a head of bluish small flowers.

L. citriodòra (or Aloýsia), the Lemon-scented or Sweet Verbena of the gardens; shrub from Chili, with whorls of linear-lanceolate fragrant leaves, roughish with glandular dots, and small whitish and bluish flowers in slender spikes.

4. LANTÀNA. (Origin of name obscure.) Tropical or subtropical, mostly shrubby plants, planted out in summer, when they flower freely until frost comes; stems often rough-prickly; herbage and flowers odorous, in some pleasant, others not so. The species are much mixed.

L. Càmara, from Tropical America, has flowers deep yellow, turning first to orange, then to red.

L. mixta, from Brazil, has flowers opening white, soon changing to yellow, orange, and finally to red.

L. nívea, from Brazil, has the pleasant-scented flowers white and unchanging; or, in var. MUTABILIS, changing to bluish.

L. involucràta, of West Indies, has small obovate and prominently veiny leaves, more or less downy beneath, and heads of lilac-purple flowers, involucrate by the outer bracts.

L. Sellowiàna, of Southern Brazil, is low and spreading, with wedge-oblong or ovate strongly veined leaves, long peduncles, and heads of reddish-purple flowers lengthening somewhat with age.

5. CALLICÁRPA. (From Greek for *beautiful fruit.*) Fl. early summer.

C. Americàna, FRENCH MULBERRY. Rich soil from Virginia S.: shrub 3° – 8° high, with some scurfy down, especially on the lower face of the ovate-oblong toothed leaves, and the clusters of bluish flowers; fruits violet-blue and showy.

6. VÌTEX, CHASTE-TREE. (The ancient Latin name.)

V. Agnus-cástus, CHASTE-TREE, of Mediterranean region, has 5 – 7 lanceolate entire leaflets whitened underneath, and bluish flowers in sessile clusters forming an interrupted spike at the end of the branches; hardy only S.

V. incìsa, of Northern China, barely hardy in gardens N., has 5 – 7 leaflets lanceolate and cut-pinnatifid, and the clusters of bluish flowers peduncled.

79. LABIATÆ, MINT FAMILY.

Chiefly herbs, with aromatic herbage, square stems, opposite simple leaves, more or less 2-lipped corolla (whence the name of the order), either 4 didynamous or only 2 stamens, 2-lobed stigma, and at once distinguished from all the related families by the deeply 4-parted ovary (as if 4 ovaries around the base of a common style), ripening into as many seed-like nutlets, or akenes, each containing a single seed. Embryo usually filling the seed. As in all these families, there are 2 lobes belonging to the upper and 3 to the lower lip of the corolla. Flowers from the axils of the leaves or bracts, usually in cymose clusters, or running into terminal racemes or spikes.

§ 1. *Stamens 4, parallel and ascending, and projecting from a notch on the upper side of the corolla. Nutlets reticulated and pitted, obliquely fixed by the inner side near the base.*

* *Lobes of the corolla nearly equal and oblong, turned forward so that there seems to be no upper lip, the filaments conspicuously projecting from the upper side.*

1. TEUCRIUM. Calyx 5-toothed. Corolla with a deep cleft between the two upper lobes. Cells of the anther confluent.
2. TRICHOSTEMA. Calyx 5-cleft in 2 lips, oblique. Filaments very long and slender, curved, coiled up in the bud.

* * *Lobes of the corolla equally spreading: filaments slightly projecting from the notch between the 2 upper lobes.*

3. ISANTHUS. Calyx bell-shaped, equally 5-lobed, enlarging after flowering. Corolla only little longer than the calyx, bell-shaped, with 5 equal spreading lobes.

§ 2. *Stamens 4, reclining on the lower lobe of the corolla, the outer or lower pair longer: anthers 2-celled. Corolla usually turned down or declining. Nutlets smooth or smoothish, fixed by their base, as in all the following divisions.*

. OCIMUM. Calyx deflexed in fruit, 5-toothed, the upper tooth or lobe much broadest and sometimes wing-margined. Corolla short, the upper lip as it were of 4 lobes, the lower of one entire flat or flattish declined lobe scarcely longer than the upper. Filaments separate.

5. COLEUS. Calyx as in No. 4. Corolla similar, but the lower lobe longer and concave or boat-shaped, enclosing the stamens and style: filaments monadelphous.

6. HYPTIS. Calyx with 5 less unequal or equal teeth. Corolla of 4 short similar upper lobes, and a longer abruptly deflexed saccate lower one; filaments separate.

7. LAVANDULA. Calyx not deflexed, 13 – 15-nerved, 5-toothed, the upper tooth mostly larger. Corolla with tube longer than the calyx, regularly 2-lipped, i. e. upper lip 2-lobed, lower 3-lobed, the lobes all equally spreading. Stamens included, but declined towards the lower lobe of the corolla.

§ 3. *Stamens 4 (and the lower or outer pair longest) or 2, straight and distant or diverging: anthers plainly 2-celled, not conniving in pairs. Lobes of the corolla flat and spreading, or the upper erect but not arched.*

* *Corolla short and rather bell-shaped, hardly if at all 2-lipped, the 4 or rarely 5 lobes nearly equal and all spreading.*

8. PERILLA. Calyx in flower 5-cleft, in fruit nodding and enlarging, becoming 2-lipped. Corolla 5-cleft, the lower lobe a little longer. Stamens 4, nearly equal. Style deeply 2-cleft.

9. MENTHA. Calyx equally 5-toothed. Corolla with a 4-cleft border, the upper lobe a little broader and sometimes notched at the end. Stamens 4, nearly equal, similar.

10. LYCOPUS. Calyx 4 – 5-toothed. Corolla with 4 about equal lobes. Stamens 2: the upper pair, if any, without anthers.

* * *Corolla evidently 2-lipped, but all the lobes of nearly equal length, the upper lip erect and mostly notched, the lower spreading and 3-cleft, the tube not bearded within: stamens with anthers only 2.*

11. CUNILA. Calyx equally 5-toothed, striate, very hairy in the throat, one half shorter than the corolla. Stamens 2, long and protruding: no rudiments of the other pair.

12. HEDEOMA. Calyx 2-lipped, gibbous on the lower side near the base, hairy in the throat. Corolla short. Stamens 2, with anthers scarcely protruded, and 2 sterile short filaments tipped with a little head in place of anther.

* * * *Corolla elongated and irregular: the lower lobe or lip much the larger, pendent, cut-toothed or fringed, the 4 others nearly equal and alike: tube with a bearded ring inside at the bottom of the enlarged throat: stamens 2 with anthers or rarely 4.*

13. COLLINSONIA. Calyx ovate, enlarging and turned down after flowering, 2-lipped, the upper lip flat and 3-toothed, the lower 2-cleft. Cells of the anther diverging.

* * * * *Corolla evidently 2-lipped, short, the upper lip erect or somewhat spreading and nearly entire or notched, the lower spreading or 3-cleft: stamens with anthers 4.*

14. HYSSOPUS. Calyx tubular, 15-nerved, equally 5-toothed, naked in the throat. Corolla with the middle lobe of the lower lip larger and 2-cleft. Stamens very long and protruding.

15. PYCNANTHEMUM. Calyx oblong or short-tubular, about 13-nerved, equally 5-toothed or somewhat 2-lipped, naked in the throat. Corolla with the lobes of the lower lip ovate and entire. Flowers crowded in heads or close cymes.

16. ORIGANUM. Calyx hairy in the throat, about 13-nerved. Lower lip of the corolla of 3 similar lobes. Flowers crowded into spike-like clusters and furnished with imbricated often colored bracts.

17. THYMUS. Calyx ovate, hairy in the throat, 13-nerved, 2-lipped; the upper lip 3-toothed and spreading, the lower cleft into 2 awl-shaped ciliate lobes. Corolla not strongly 2-lipped, the upper lip resembling the 3 lobes of the lower lip but notched at the apex. Stamens mostly protruding.

18. SATUREIA. Calyx bell-shaped, naked in the throat, 10-nerved, equally 5-toothed. Corolla with lower lip of 3 nearly equal entire lobes. Stamens somewhat ascending. Leaves narrow.

§ 4. *Stamens 4 (the lower or outer pair longer), ascending or curved and with the plainly 2-celled anthers approximate or conniving in pairs under the erect and flattish but not arched upper lip. Calyx more or less 2-lipped.*

19. CALAMINTHA. Calyx not flattened. Corolla straight, with inflated throat, and 2-lipped border, the spreading lower lip 3-parted, its middle lobe entire or slightly notched.

20. MELISSA. Calyx with 3-toothed upper lip flat. Corolla more or less curved and ascending. Filaments arching and bringing the anthers together in pairs. Otherwise as in 19.

§ 5. *Stamens only 2, parallel and ascending under the erect or somewhat scythe-shaped entire or barely notched upper lip of the corolla: anthers 1-celled, either strictly so or by confluence of the 2 cells end to end.*

21. SALVIA. Calyx 2-lipped, the upper lip 3-toothed or entire, the lower 2-cleft, throat not hairy. Corolla deeply 2-lipped; the lower lip spreading or hanging, 3-lobed, the middle lobe larger and sometimes notched at the end. Filament as it were compound, the proper filament short and bearing on its apex an elongated thread-like or linear body (the connective, in fact) attached by its middle, one end of which ascending under the upper lip bears a linear 1-celled anther, the other descending bears the other smaller and imperfect cell, or a mere vestige of it, or is naked. Flowers usually large or showy.

22. ROSMARINUS. Calyx and corolla nearly as in Salvia, but the lateral lobes of the lower lip of the corolla erect and somewhat contorted (as in some Sages also). Stamens resembling those of Monarda and protruded, but with a short tooth on the filament below the middle. Shrub.

23. MONARDA. Calyx tubular, elongated, many-nerved, nearly equally 5-toothed, mostly hairy in the throat. Corolla deeply 2-lipped, narrow in the throat, the oblong or linear lips about equal in length, the lower 3-lobed at the apex, its narrower middle lobe slightly notched. Stamens with long and simple filament bearing directly on its apex a linear anther. Flowers rather large, numerous in the whorled or terminal heads.

24. BLEPHILIA. Calyx short-tubular, naked in the throat, 2-lipped, the upper lip with 3 awned, the lower with 2 nearly blunt teeth. Corolla with a more expanded throat, bluish. Otherwise like Monarda, but flowers smaller.

§ 6. *Stamens 4, diverging or ascending: the upper or inner pair longer! Upper lip of the corolla erect or a little arching, the lower spreading.*

25. LOPHANTHUS. Calyx rather unequally 5-toothed. Upper lip of corolla slightly 2-lobed, the lower moderately spreading, its middle lobe somewhat crenate. Stamens not parallel, the lower and shorter ones more or less ascending, the upper and longer ones diverging and declining, so as to seem the lower. Tall erect herbs, with small flowers clustered in panicled spikes.

26. NEPETA. Calyx obliquely 5-toothed. Stamens parallel and ascending, and their anthers approaching in pairs under the upper lip of the corolla, their cells diverging from each other. Middle lobe of lower lip of corolla considerably largest.

27. CEDRONELLA. Flowers nearly like those of Nepeta: but the cells of the anthers parallel.

37. PHLOMIS, of the next section, might from the stamens be sought for here.

§ 7. *Stamens 4, the lower or outer pair longer, ascending and parallel, their anthers in pairs mostly under the concave or arched upper lip of the corolla. Plants not sweet-scented, some of them bitter-aromatic.*

* *Corolla inflated funnel-form and rather slightly 2-lipped: calyx thinnish, open bell-shaped in fruit, the 5 teeth equal and pointless: flowers simply spiked, only one to each bract or floral leaf.*

28. PHYSOSTEGIA. Upper lip of the corolla broad and a little arched, entire; lower of 3 broad and somewhat spreading short lobes. Smooth and scentless herbs, with thickish and sessile lanceolate or oblong leaves.

* * *Corolla decidedly 2-lipped: calyx also 2-lipped, irregular, closed in fruit.*

29. BRUNELLA. Calyx tubular bell-shaped, reticulated, flattened on the upper side; the upper lip broad, flat, 3-toothed; the lower 2-cleft. Tube of the corolla dilated on the lower side just below the rather narrowed throat; upper lip arched and entire; lower widely spreading, with lateral lobes oblong, the concave middle one rounded and crenulate. Filaments 2-toothed at the apex, the lower tooth bearing the anther. Flowers in a terminal close head or short spike.

30. SCUTELLARIA. Calyx short, with the very short lips truncate and entire, and a large hump on the upper side, the whole helmet-shaped: the upper lip usually falling away when the fruit is ripe. Corolla with rather long ascending tube, the lateral lobes of the lower lip small and somewhat connected with the arched upper lip, the middle lobe larger and spreading or the [illegible]: anthers of the lower stamens 1-celled. Bitterish herbs, not aromatic, with flowers single in the axil of each bract or leaf.

* * * *Corolla decidedly 2-lipped: calyx 5-toothed, regular, or sometimes obscurely 2-lipped, not closing in fruit: the teeth commonly awl-shaped or triangular, often rigid or spiny-tipped.*

← *Stamens included in the tube of the corolla: calyx 10-toothed.*

31. MARRUBIUM. Teeth of the calyx awl-shaped or spiney-tipped, recurved after flowering. Corolla small: upper lip erect. Bitter-aromatic plants: flowers in axillary capitate whorls.

← ← *Stamens raised out of the tube of the corolla: calyx 5-toothed.*

↔ *Anthers opening crosswise by 2 unequal valves, the smaller one ciliate.*

32. GALEOPSIS. Calyx tubular bell-shaped, 5-nerved, with spiny-tipped teeth. Corolla enlarged in the throat, the ovate and entire upper lip arched, the middle lobe of spreading lower lip obcordate. Flowers in axillary whorl-like clusters.

↔ ↔ *Anthers opening lengthwise in the ordinary way.*

33. LAMIUM. Calyx tubular bell-shaped, with 5 awl-shaped spreading teeth. Corolla much enlarged in the throat, the upper lip arching and with a narrow base, lateral lobes of lower lip very short, the middle one rounded and spreading or turned down, its base much narrowed. (Lessons, p. 102, fig. 209.) Stamens ascending under the upper lip. Nutlets truncate at the top.
34. LEONURUS. Calyx top-shaped, the awl-shaped teeth when old spreading and spiny-pointed. Corolla like Stachys, but middle lobe of lower lip obcordate. Stamens parallel. Nutlets truncate and sharply 3-angled. Stems erect. Flowers in close whorls in the axils of cut-lobed leaves.
35. STACHYS. Calyx mostly tubular bell-shaped, the teeth triangular or awl-shaped, sometimes rigid or even pungent. Corolla not enlarged in the throat, the upper lip entire or nearly so, the lower 3-lobed with the middle lobe nearly entire. Stamens ascending under the upper lip, but the outer pair turned down after discharging their pollen! Nutlets obtuse, but not truncate. Flowers crowded in whorls, most of these commonly approximate in a terminal raceme or spike.
36. BETONICA. Like Stachys, but calyx more tubular and with awn-like teeth, tube of corolla longer and its upper lip sometimes notched, and the stamens generally remaining parallel.
37. PHLOMIS. Calyx tubular, with rigid narrow awl-shaped teeth from the notch of as many very short and broad lobes. Corolla as in Stachys. Upper pair of stamens (rather the longer) with an awl-shaped appendage at the base of the filaments.
38. MOLUCCELLA. Calyx membranaceous and greatly enlarged, funnel-form, the border reticulated, veiny, entire, except 5 mucronate points. Corolla much shorter than the calyx; the middle lobe of its lower lip obcordate. Nutlets 3-sided.

1. TEÙCRIUM, GERMANDER. (Named for *Teucer*, king of Troy.) ♃

T. Canadénse, our only species, in low grounds, 1°–3° high, downy, with ovate-lanceolate serrate leaves downy beneath, and pale purple or rarely white flowers collected in a long spike, in late summer.

2. TRICHOSTÈMA, BLUE CURLS. (Name from the Greek, means *hair-like stamens.*) Ours are branching loosely-flowered rather clammy low herbs, with entire leaves, and small flowers as it were panicled, blue, or changing to purple, in summer and autumn. ①

T. dichótomum, COMMON B. or BASTARD PENNYROYAL. Sandy fields E. & S.: 6′–12′ high, with mostly lance-oblong short-petioled leaves.

T. lineàre, from New Jersey S., has linear or lance-linear smoother leaves.

3. ISÁNTHUS, FALSE PENNYROYAL. (Name in Greek means *equal flower*, i. e. parts of corolla regular.) ①

I. cærùleus. Common in sandy or sterile soil; bushy-branched, clammy-pubescent, 6′–12′ high, with oblong 3-nerved entire leaves, and scattered small blue flowers on axillary peduncles: all summer.

4. ÒCIMUM, SWEET BASIL. (Greek name, referring to the odor, the herbage sweet-scented.)

O. Basílicum, Sweet Basil. Low sweet-herb, of kitchen-gardens, from India, with ovate somewhat toothed leaves, ciliate petioles and calyx, and bluish-white racemed flowers, in summer. ①

5. CÒLEUS. (Name from the Greek word for *sheath*, alluding to the monadelphous stamens.)

C. Blùmei, of Java, especially its var. Verschaffélti, the showy species of ornamental grounds in summer, planted for its richly-colored ovate pointed and coarsely toothed leaves, either blotched with crimson or bronze-red, or almost wholly colored; the inconspicuous flowers blue or bluish and racemed.

6. HÝPTIS. (From a Greek word meaning *reversed.*) Fl. late summer.

H. radiàta. Low ground, North Carolina & S.: stems 2°–4° high; leaves lance-ovate, toothed; flowers white or purple-dotted, small, crowded in peduncled whitish-involucrate heads. ♃

7. LAVÁNDULA, LAVENDER. (From Latin *lavo*, to lave, for which Lavender-water is used.)

L. vèra, Garden L. Cult. from S. Europe: a low undershrub, barely hardy N., hoary, with lance-linear leaves, and slender spikes of bluish small flowers on long terminal peduncles, in summer.

8. PERÍLLA. (Name unexplained.) Natives of China and Japan. ①

P. ocimoìdes, var. **críspa,** or P. Nankinénsis of the gardens: a balsamic-scented much-branched herb, cult. for its foliage, the ovate-petioled leaves in this variety dark purple or violet-tinged beneath, bronze-purple above, the margins wavy and deeply cut-toothed, the insignificant rose-colored or whitish flowers in panicled spike-like racemes, in late summer.

9. MÉNTHA, MINT. (Ancient Greek and Latin name.) One native and two very common naturalized European species, mostly spreading rapidly by running rootstocks; leaves toothed; the small flowers purplish-bluish, or almost white, in summer. ♃ The following common Mints all in wet places.

M. víridis, Spearmint. Nearly smooth, with oblong or lance-ovate wrinkled-veiny sessile leaves, and flowers in narrow terminal spikes.

M. piperìta, Peppermint. Smooth, with ovate acute petioled leaves, and whorled clusters of flowers forming loose interrupted spikes.

M. Canadénsis, Wild Mint. Along shaded brooks; pleasant-scented, hairy or a smooth variety, with ovate or lance-oblong acute or pointed leaves on short petioles, and whorls of flowers in the axils of some of the middle pairs.

10. LÝCOPUS, WATER-HOREHOUND. (Name in Greek means *wolf's foot.*) Resembling the Wild Mint, but bitter, and not aromatic, commonly producing slender sometimes tuber-bearing runners from the base, smooth, the very small white flowers close-clustered in the axils of the leaves, in summer. Wild in shady moist soil. ♃

L. Virgínicus, Bugleweed. Common N.; stems blunt-angled, 6′–18′ high; leaves mostly lance-ovate and merely toothed; calyx-teeth 4, ovate and bluntish. Used in medicine.

L. Europæus, under several varieties: common N. & S., is taller, with sharply 4-angled stems, ovate-oblong or lanceolate leaves either toothed or pinnatifid, many flowers in the clusters or whorls, and 5 calyx-teeth rigid and sharp-pointed.

11. CUNÌLA, DITTANY. (An old Latin name of unknown meaning.)

C. Mariàna, Maryland D. Dry hills through the Middle States; nearly smooth, 1° high, corymbosely much branched, with ovate or heart-shaped almost sessile serrate leaves (1′ long), and peduncled loose cymes of purplish flowers, in summer. ♃

12. HEDEÒMA. (Formed from a Greek name of a sort of Mint, refers to the sweet scent.) Low and fragrant-scented, growing in dry and open or sterile grounds, with small flowers in loose axillary clusters, all summer.

H. pulegioìdes, American Pennyroyal, the pungent aromatic scent and taste being like that of the English Pennyroyal or Mentha Pulegium of Eu.; very common, 5′ – 8′ high, hairy, branching, with oblong-ovate petioled leaves, few flowered clusters, and bluish corolla scarcely exceeding the calyx. ①

H. híspida, is common from Western Illinois S. W.; 2′ – 5′ high, hairy, with sessile linear entire leaves, and bristly-ciliate calyx. ①

13. COLLINSÒNIA, HORSE-BALM. (Named for *Peter Collinson* of London, who corresponded with Bartram and Linnæus.) Rather tall and large-leaved strong-scented plants: fl. summer. ♃

C. Canadénsis, also called Rich-weed and Stone-root, the only common species, in rich moist woods; smooth, 2° – 3° high, with ovate serrate leaves 3′ – 6′ long and on long petioles, and pale yellow lemon-scented flowers on slender pedicels in panicled racemes.

14. HYSSÒPUS, HYSSOP. (The ancient Greek name of the plant, from the Hebrew.) ♃

H. officinàlis, the only species, cult. in gardens from the Old World, rarely running wild: smooth tufted simple stems or branches 2° high; leaves lance-linear and entire; small clusters of blue flowers crowded in a terminal spike, in summer.

15. PYCNÁNTHEMUM, MOUNTAIN MINT or BASIL. (Name from Greek, means *dense flower-clusters*.) Several species, all aromatic-scented, 1° – 3° high, in open usually gravelly or sandy soil; flowers with pale corolla often purple-dotted, in late summer and autumn. ♃ Only the following widely common.

P. incànum. Leaves petioled, ovate or oblong, remotely toothed, finely soft-downy above and white-hoary beneath, those next the open flat cymes whitened both sides; bracts and calyx-teeth somewhat awn-pointed.

P. mùticum. Minutely soft-downy but hardly whitened, rather low, bushy-branched; leaves mostly lance-ovate and sessile, with rounded or slightly heart-shaped base, minutely sharp-toothed, rather rigid; flowers in heads or dense clusters; calyx-teeth and inner bracts rather blunt.

P. pilòsum. Only from W. Penn. W., is downy with rather long soft hairs; the broadish lanceolate leaves acute at both ends and nearly entire; whorled heads at the end of the branches; the calyx-teeth and bracts ovate-lanceolate and acute.

P. aristàtum. Only from New Jersey S., in pine-barrens: minutely soft-pubescent; leaves lance-oblong or broadly linear, rigid, almost entire; flowers in heads, with the narrow and awn-pointed bracts and calyx-teeth as long as the corolla.

P. lanceolàtum. Smoothish, not hoary, very leafy, bushy branched; leaves small and clustered, narrow lanceolate or lance-linear, rigid, sessile, obtuse at base; flowers small, in numerous globular close heads which are crowded in terminal corymbs; calyx-teeth and bracts short, triangular; lips of the corolla very short.

P. linifòlium. Like the last, less common N.: smoother, with lance-linear leaves, and narrower sharp-pointed bracts and calyx-teeth.

16. ORÍGANUM, MARJORAM. (Old Greek name, said to mean *delight of mountains.*) Natives of the Old World: sweet-herbs: fl. summer. ♃

O. vulgàre, WILD MARJORAM. Old gardens, and wild on some road-sides; 1° – 2° high, with small ovate nearly entire leaves, on short petioles, and purplish flowers in corymbed purple-bracted clusters or short spikes; calyx equally 5-toothed.

O. Majoràna, SWEET MARJORAM. Cult. in kitchen-gardens (as an ①); leaves small and finely soft-downy; the bracts not colored; flowers whitish or purplish, with calyx hardly toothed but cleft nearly down on the lower side.

17. THÝMUS, THYME. (Ancient Greek and Latin name) Low or creeping slightly woody-stemmed sweet-aromatic plants of the Old World: fl. small, in summer. Leaves in the common species entire, small, from ¼′ to near ½′ long, ovate, obovate or oblong with tapering base. ♃

T. Serpýllum, CREEPING THYME. Cult. as a sweet herb, rarely a little spontaneous; creeping, forming broad flat perennial turfs; leaves green; whorls of purplish or flesh-colored flowers crowded or somewhat spiked at the ends of the flowering branches.

T. vulgàris, COMMON THYME. Rarely cult., more upright and bushy than the other, pale and rather hoary; flowers in shorter clusters.

18. SATURÈIA, SAVORY. (The ancient Latin name.) Aromatic: fl. summer.

S. horténsis, SUMMER SAVORY. Low and homely sweet herb of the gardens, sparingly run wild W., with oblong-linear leaves tapering at base, and pale or purplish small flowers clustered in their axils, or running into panicled spikes at the end of the branches. ①

19. CALAMÍNTHA, CALAMINTH. (Greek for *beautiful Mint.*) Fl. summer. ♃

§ 1. *Flowers loose in the axils, or above running into racemes or panicles.*

C. glabélla. A delicate native but uncommon species, only from Niagara Falls W.: smooth, with weak stems 5′ – 20′ long, also with creeping runners, oblong or almost linear leaves, or ovate on the runners, the loose purplish flowers about ⅓′ long.

C. Népeta, BASIL-THYME. Nat. from Eu. from Virginia S.: soft-downy, branching, 1° – 2° high, with round-ovate crenate leaves, small and loose purple flowers, and calyx hairy in the throat.

§ 2. *Flowers in terminal heads or head-like whorls, crowded with awl-shaped bracts.*

C. Clinopòdium, BASIL. Waste grounds and along thickets; hairy, with rather simple stems 1° – 2° long, ovate and nearly entire petioled leaves, and pale purple small corollas.

20. MELÍSSA, BALM, BEE-BALM. (Old name from Greek for *bee.*) Old-World sweet herbs. Fl. summer. ♃

M. officinàlis, COMMON B. Gardens, sparingly running wild; rather hairy, loosely-branched, lemon-scented, with ovate or scarcely heart-shaped crenate-toothed leaves, and yellowish or soon white flowers in small loose axillary clusters.

21. SÁLVIA, SAGE. (From the Latin *salvo*, to save, from its reputed healing qualities.)

§ 1. WILD SAGES *of the country, all with blue or partly white corollas.* ♃

* *Upper lip of calyx 3-toothed: lower cell of the anther present but deformed.*

S. lyràta. Sandy soil from New Jersey to Ill. & S.: 1° – 2° high, rather hairy, with leaves mostly at the root and obovate or lyre-shaped, and a smaller pair on the stem; whorls of flowers forming an interrupted raceme; corolla hardly 1′ long.

* * *Upper lip of the calyx entire: lower cell of the anther wanting.*

S. urticifòlia. Woodlands from Maryland S.: 1° – 2° high, leafy, somewhat clammy-downy; leaves rhombic-ovate; racemes slender, the blue and white corolla only ½′ long.

S. azùrea. Sandy soil S. & S. W.: nearly smooth and green, with rather simple stems, 2° – 4° high; leaves lance-linear with tapering base, obtuse, entire, or the lower serrate; the showy azure-blue flowers (less than 1′ long) numerous in a spike-like raceme.

S. Pitcheri, from Kansas to Texas, is very like the foregoing, but minutely soft-downy; occasionally cultivated, as is also

S. farinòsa, of Texas, with more petioled oblong-lanceolate leaves, the spikes, calyxes, &c. white-hoary, in contrast with the light blue corolla.

§ 2. GARDEN SAGES, *cultivated for ornament, or the first species for its savory foliage. Perennials, but some cult. as annuals, several woody at base.*

* *Flowers blue.*

S. officinàlis, COMMON SAGE, from S. Eu.: low, minutely hoary-pubescent, with oblong-lanceolate leaves finely reticulated-rugose and the margins crenulate, spiked flower-whorls, and short corolla.

S. pàtens, from Mexico: 2° – 3° high, rather hairy, with crenate triangular-ovate or halberd-shaped leaves, or the uppermost sessile ones oval, loose-pedicelled flowers, showy deep blue corolla over 2′ long, the lips widely gaping and the stamens exserted.

* * *Flowers scarlet-red.*

S. splèndens, SCARLET SAGE, of Brazil: smooth, with branching stems, ovate pointed leaves, the floral ones and calyx as well as the corolla (2′ or more long and with short lower lip) bright scarlet.

S. fúlgens, CARDINAL OR MEXICAN RED S., from Mexico: tall, pubescent, with crenate ovate or oval leaves heart-shaped at base and somewhat rugose, green calyx, and long-tubed downy deep scarlet corolla over 2′ long, the style plumose.

S. coccínea, from Tropical America: somewhat downy or soft-hairy, with ovate and heart-shaped acute crenate leaves, deciduous bracts, green or purplish calyx, and smooth red corolla 1′ long, with lower lip much longer than the upper one.

S. pseudo-coccínea, from Trop. Amer.: like the last, but with bristly-hairy stems, less heart-shaped leaves, and corolla more or less pubescent.

* * * *Flowers white.*

S. argéntea, from the Mediterranean regions: cult. for its silvery-white foliage, hardy; the very large round-ovate root-leaves clothed with long white wool; flowering stem and its sessile leaves, as well as calyx, &c. clammy-hairy; the white corolla with scythe-shaped upper lip 1′ long and a very short tube.

22. ROSMARÌNUS, ROSEMARY. (Old Latin name, *dew of the sea.*)

R. officinàlis, from S. Eu.: not hardy N.: leaves evergreen, linear, entire, with revolute margins, white hoary beneath, the upper with pale blue flowers in their axils.

23. MONÁRDA, HORSE-MINT or BALM. (Named for an early Spanish writer on the medicinal plants of the New World, *Monardez.*) Fl. summer.

§ 1. *Stamens and style protruding beyond the narrow acute upper lip of the corolla. leaves oblong-ovate or lance-ovate, with roundish or slightly heart-shaped base, veiny, pleasant-scented.*

M. dídyma, OSWEGO TEA OR BEE-BALM. Wet ground N., and cult.; leaves petioled; the floral ones tinged with red; calyx naked in the throat; corolla bright red.

M. fistulòsa, WILD BERGAMOT. Rocky grounds; soft-downy or smoothish; leaves petioled, the floral ones often whitish; calyx very hairy in the throat; corolla rose-color, purple, or white.

M. Bradburiàna. From Ohio W., differs from the preceding in the sessile leaves soft-hairy beneath, calyx contracted above, and shorter corolla.

§ 2. *Stamens not longer than the purple-spotted notched upper lip of the short corolla, the tube of which is nearly enclosed in the calyx.* ① ②

M. punctàta, Horse-Mint. Dry sandy ground, from New York to Ill. and S.: strong-scented and pungent, slightly hoary; leaves lanceolate, the floral ones and bracts tinged yellow and purple; calyx-teeth short and awnless; corolla yellowish.

M. aristàta. Plains from Missouri S. W., has its calyx *strongly* bearded in the throat and with awn-like teeth, the floral leaves and bracts conspicuously awn-tipped.

24. BLEPHÍLIA. (From Greek for *eyelash*, the bracts strongly ciliate, the outer ones ovate.) Fl. summer. ♃

B. ciliàta. Dry ground, from Penn. S. & W.: leaves almost sessile, ovate or oblong, whitish-downy beneath; outer bracts large, acute; corolla hairy.

B. nepetoìdes. Low shady grounds N. & W.: hairy all over; leaves lance-ovate sometimes heart-shaped at base, on distinct petioles; bracts smaller and very slender-pointed; corolla smoothish, purple-spotted.

25. LOPHÁNTHUS, GIANT HYSSOP. (Name from Greek for *crest* and *flower*, not very appropriate. Wild in rich soil, chiefly N. & W., with ovate and toothed leaves: fl. summer. ♃

L. nepetoìdes. Smooth, coarse, not sweet-scented; stem 4° - 6° high and sharply 4-angled; calyx-teeth ovate, bluntish, almost equalling the dull yellowish corolla.

L. scrophulariifòlius. Resembles the preceding, but the obtusely angled stem and sharper-toothed leaves rather pubescent, the lanceolate acute calyx-teeth shorter than the purplish corolla.

L. anisàtus. Wild from Wisconsin far N. W. and rare in cultivation: slender, with anise-scented leaves white beneath, and calyx much shorter than the lavender-blue corolla.

26. NÉPETA, CAT-MINT. (Latin name, from the city *Nepete*.) ♃

N. Catària, Catnip. Weed nat. from Eu. around dwellings and gardens: soft-downy; with oblong heart-shaped leaves deeply crenate, and whitish flowers crowded in terminal clusters or spikes, in late summer.

N. Glechòma, Ground Ivy, Gill. Weed nat. from Eu. in waste or cult. shaded grounds: creeping and spreading, with smoothish rounded kidney-shaped crenate leaves on slender petioles, and light blue flowers in their axils, each pair of anther cells approaching and forming a little cross: fl. all spring and summer.

27. CEDRONÉLLA. (From Greek name of *oil of cedar*, alluding to the sweet aromatic scent of the foliage of the first species.) The cultivated species not hardy N.: fl. summer. ♃

C. triphýlla, Balm-of-Gilead of the English gardens, here rarely cult., from Madeira; very sweet-scented leaves of 3 broadly lanceolate leaflets; flowers purplish.

C. Mexicàna, from New Mexico, has simple lance-ovate leaves with heart-shaped base, erect stems, and handsome rose-colored flowers in close clusters.

C. cordàta, wild in shady grounds from W. Penn. S., but rare: low, hairy, with long leafy runners, heart-shaped leaves, and scattered flowers, the purplish corolla 1½′ long, its throat inflated.

28. PHYSOSTÈGIA, FALSE DRAGON-HEAD. (Name from Greek words for *inflated* or *bladdery covering*.) Fl. all summer. ♃

P. Virginiàna. Wet banks of streams, from New York W. & S., in several varieties: 1° - 4° high; leaves mostly serrate; flowers either crowded or rather distant in the spikes; corolla pale rose-purple, 1′ or more long.

29. BRUNÉLLA, SELF-HEAL or HEAL-ALL. (Latinized from the old German name.) Fl. all summer. ♃

B. vulgàris. Low fields and copses low, spreading, with ovate or oblong petioled leaves, and 3 flowers under each of the broad and round purplish bracts of the head; corolla bluish-purple or rarely white.

30. SCUTELLÀRIA, SKULLCAP. (Name from Latin *scutellum*, a dish.) Fl. in summer, in species ours blue or violet. ♃

§ 1. *Flowers in racemes or spikes terminating the stem and branches.*

S. versícolor. River-banks, from Penn. W. & S.: stem stout, 1°–3° high, soft-pubescent, as are the heart-shaped very veiny and rugose crenate and bluntish long-petioled leaves; spike-like racemes clammy-pubescent; corolla almost 1′ long, the lower lip purple-spotted.

S. canéscens. From Penn. S. & W.: stems branching, 2°–4° high; leaves petioled, ovate or lance-ovate, or some of them heart-shaped at base, the lower surface as also the racemes and flowers whitish with very fine soft down, otherwise smoothish; corolla 1′ long.

S. pilòsa. Pubescent with spreading hairs; stem nearly simple, 1°–3° high, bearing rather distant pairs of roundish or oblong-ovate veiny leaves, the lower sometimes heart-shaped, upper on short-margined petioles; racemes short, the bracts spatulate; corolla ¾′ long.

S. integrifòlia. Along thickets: minutely hoary, 1°–2° high; leaves lance-oblong or linear, obtuse, nearly entire, very short-petioled; raceme short; corolla 1′ long, much enlarged upwards.

§ 2. *Flowers short-peduncled in the axils of some of the sessile leaves.*

S. nervòsa. Moist ground from New York S. W.: smooth, 1°–2° high, slender; leaves roundish or ovate, sparingly toothed, 1′ long, those subtending the flowers ovate-lanceolate and entire, the nerve-like main veins prominent beneath; flowers ¼′ long.

S. pàrvula. Dry banks and shores, commoner W. & S.: low and spreading, 3′–6′ high; with round-ovate or lance-ovate and slightly heart-shaped leaves ½′ or more long, and flowers ¼′ long.

S. galericulàta. Wet ground N.: smoothish; the slender simple stems 1°–2° high; leaves ovate-lanceolate, sometimes with a heart-shaped base, acute, serrate; flowers ¾′ long, with arched upper lip.

§ 3. *Flowers in axillary or some terminal one-sided racemes.*

S. laterifllòra. Wet shady places: smooth, branching, 1°–2° high, with lance-ovate or oblong acute coarsely serrate leaves on slender petioles; racemes rather leafy-bracted; flowers ¼′ long.

31. MARRÙBIUM, HOREHOUND. (Late Latin name, from Hebrew word for bitter.) Fl. late summer. ♃

M. vulgàre, COMMON H., from Europe, in gardens and waste places: branching, spreading, hoary-downy, with round-ovate crenate-rugose leaves on petioles, and small white corolla.

BLACK HOREHOUND, BALLÒTA NÍGRA, of Europe, and naturalized in a few places E., is not hoary, and has purplish flowers with a spreading 5-toothed border to the calyx.

32. GALEÓPSIS, HEMP-NETTLE. (Name in Greek means *like a weasel*; the likeness not at all obvious.) Fl. summer. ①

G. Tetràhit, COMMON H. Damp waste and cult. grounds, nat. from Eu.: a common weed, rather bristly-hairy, with stem swollen below each joint, leaves ovate and coarsely serrate, and corolla purplish or variegated.

33. LÀMIUM, DEAD-NETTLE. (Name from Greek word for *throat*.) Low spreading herbs from Old World: fl. spring and summer.

* *Insignificant weeds in waste or cultivated grounds, with few small and purple or slender flowers in some of the axils.* ① ②

L. amplexicàule. Leaves rounded, deeply crenate-toothed and cut, the upper ones clasping; corolla with a long tube, its upper lip bearded, the lower one spotted.

L. purpùreum. Not so common: leaves more heart-shaped, and less cut, all of them petioled.

* * *Flowers larger, 1′ long, in several axillary whorls: corolla ascending, the lateral lobes bearing a slender awl-shaped appendage.* ♃

L. álbum. Gardens and waste grounds: hairy; leaves all petioled, ovate and heart-shaped, rugose-veiny; flowers white.

L. maculàtum. Cult. in gardens; hairy or nearly smooth; leaves as in the other, but with a white spot or blotch on the upper face; flowers purple.

34. LEONÙRUS, MOTHERWORT. (Name in Greek means *lion's tail*, but there is no obvious resemblance.) Fl. late summer.

L. Cardìaca, Common M. Nat. from Eu. in cult. and waste grounds; tall, with palmately cleft long-petioled leaves, the lower rounded, the upper wedge-shaped at base; upper lip of pale purple corolla bearded. ♃

35. STÀCHYS, HEDGE-NETTLE. (Greek word for *spike*, from the inflorescence.) Flowers in summer, in all ours ♃.

* *Wild species in wet grounds, with small light reddish-purple corolla.*

S. palústris. Common in many and diverse varieties, rough-hairy or smooth, or the angles of the stem bristly; leaves oblong or lance-ovate, or the lower heart-shaped at base, crenately toothed, the lower or nearly all petioled; calyx-teeth sharp-pointed or pungent.

S. hyssopifòlia. Wet sandy soil, not common: smooth, low (1° high); leaves linear or linear-oblong, almost entire, sessile; calyx-teeth softer and less pointed.

* * *Cultivated for ornament: not very common.*

S. lanàta, from Europe: low, tufted; the stems, oblong Mullein-like leaves, and dense interrupted spike wholly covered with thick and silvery white wool, and very short dull purple corollas.

S. coccínea, Scarlet S., from Mexico, with ovate-oblong and heart-shaped pubescent leaves, and whorled flowers with bright red corolla, its tube often 1′ long.

36. BETÓNICA, BETONY. (The Latin name.) Cult. occasionally in old gardens, from Old World. Stems low, erect: leaves coarsely crenate, oblong, those on the stem few, of the root larger and heart-shaped on long petioles. Fl. summer. ♃

B. grandiflòra, Great B., from Northern Asia; with stem 1° – 2° high, flowers in separated whorls, purple corollas 1½′ long.

B. officinàlis, Wood B., from Europe, has flowers many times smaller, in a more crowded oblong spike.

37. PHLÒMIS, JERUSALEM SAGE. (Old Greek name of some woolly plant.) Fl. summer. ♃

P. tuberòsa, from E. Eu.: cultivated in old gardens, sparingly run wild; stems 3° – 5° high; leaves ovate or ovate-oblong and heart-shaped, crenate, rugose, smoothish; flowers in remote and dense whorls; upper lip of the purple corolla white-hairy inside.

38. MOLUCCÉLLA, MOLUCCA BALM, SHELL-FLOWER. (Name from Molucca Islands.) Fl. summer. ①

M. lævis, from Asia: in some old gardens: low, much branched, smooth, with roundish petioled leaves, flowers sessile in their axils accompanied by spine-like bracts, the remarkable large cup-shaped calyx oblique and 1′ long, much exceeding the inconspicuous corolla.

80. BORRAGINACEÆ, BORAGE FAMILY.

Mostly rough or rough-hairy plants, known from all related monopetalous orders by having a deeply 4-lobed ovary, or apparently 4 ovaries around the base of a common style, each 1-ovuled, ripening into akenes or nutlets, along with regular flowers (Echium excepted), stamens as many as the lobes of the corolla (5) and alternate with them, and alternate (mostly entire) leaves. In the Heliotrope tribe, however, the ovary is not lobed, but the fruit at maturity separates into 2 or 4 nutlets. Stigmas 1 or 2. Embryo filling the seed: no albumen. Flowers disposed to be on one side of the stem or branches, or of the branches of cymes, the raceme-like clusters coiled at the end and straightening as the flowers expand. Herbage not aromatic; juice commonly bitterish, often somewhat mucilaginous. Roots of several are red and used for dye.

I. BORAGE FAMILY PROPER, having the deeply 4-parted ovary as above. Ours all herbs.

§ 1. *Corolla irregular funnel-form, naked in the throat: stamens unequal!*

1. ECHIUM. Two of the spreading lobes of the corolla shorter than the others. Stamens ascending, more or less protruding: filaments and style long and slender. Stigmas 2. Nutlets erect, leathery, rough-wrinkled.

§ 2. *Corolla wheel-shaped, with no tube at all.*

2. BORRAGO. Flowers, as in all the following, perfectly regular. A blunt scale at the base of each lobe of the 5-parted corolla, alternating with the conniving stamens. Filaments very short, broad, and with a cartilaginous projection behind the linear pointed anther. Nutlets erect.

6. MYOSOTIS, and 7. OMPHALODES, from the short tube to the corolla may be sought for here.

§ 3. *Corolla tubular, funnel-form, or salver-shaped, sometimes almost wheel-shaped,*

* *Open in the throat, the folds or short scales, if any, not closing over the orifice.*

3. MERTENSIA. Corolla tubular, trumpet-shaped, with the widely spreading border scarcely at all lobed and its throat perfectly naked in the common species; the slender filaments protruding. Fruit fleshy, smooth or wrinkled. Smooth plants, which is rare in this order.

4. ONOSMODIUM. Corolla tubular, with the 5 acute lobes erect or converging, the throat perfectly naked, bearing the arrow-shaped or linear and mucronate anthers: filaments hardly any. Style very slender and protruding. Nutlets stony, smooth, fixed by their base. Very rough-bristly homely plants.

5. LITHOSPERMUM. Corolla funnel-form or salver-shaped, with rounded lobes imbricated in the bud, with or without evident short and broad scales or folds in the throat. Anthers oblong, included: filaments hardly any. Nutlets stony, smooth or roughened, ovate, fixed by the base. Rough or hairy plants, mostly with red roots.

6. MYOSOTIS. Corolla very short-salver-form, the tube only about the length of the 5-toothed or 5-cleft calyx, the rounded lobes convolute in the bud, the throat with 5 small and blunt arching appendages. Anthers short, included. Nutlets smooth and hard, fixed by their base. Low and small, mostly soft-hairy plants, the small racemed flowers commonly bractless.

* * *Scales or appendages of the corolla, conspicuous one before the base of each lobe, and closing or nearly closing the orifice.*

+- *Corolla short-salver-shaped or nearly wheel-shaped: stamens included.*

7. OMPHALODES. Corolla with tube shorter than the rounded lobes. Nutlets smooth, depressed, and with a hollow basket-like top. Flowers loosely racemed: no bracts. Low smooth or smoothish herbs.

8. ECHINOSPERMUM. Corolla with tube as short as the rounded lobes, the throat closed with short rounded scales. Nutlets erect, fixed to the central column or base of the style, triangular, roughened, and bearing one or more marginal rows of barb-tipped prickles, forming small burs. Coarse weeds, with leafy-bracted racemed flowers.
9. CYNOGLOSSUM. Corolla between short funnel-form and wheel-shaped, the tube about the length of the rounded lobes; throat closed by the blunt scales. Nutlets bur-like, oblique on the expanded base of the style, to which they are fixed by their apex, roughened all over with short barbed or hooked prickles. Coarse and strong-scented plants, with racemed flowers, the lower *sometimes* bracted, *otherwise* bractless.

+ + *Corolla tubular and more or less funnel-shaped.*

10. LYCOPSIS. Corolla with a curved tube, slightly oblique 5-lobed border, and bristly-hairy scales in the throat. Stamens included in the tube. Nutlets rough-wrinkled, erect, fixed by a hollowed base. Coarse, rough-bristly plants.
11. SYMPHYTUM. Corolla straight, tubular-funnel form, with short spreading lobes which are somewhat longer than the large awl-shaped scales and the linear or lanceolate anthers. Style slender, commonly protruding. Nutlets erect, smooth, coriaceous, fixed by a hollowed base. Coarse herbs, branching and leafy, with thickened or tuberous roots, the juice mucilaginous and bitterish, used in popular medicine. Flowers nodding in raceme-like often forked clusters, either naked or leafy-bracted at base.

II. HELIOTROPE FAMILY, the ovary not divided but tipped with the simple style, the fruit when ripe separating into 2 or 4 closed pieces or nutlets.

12. HELIOTROPIUM. Corolla short funnel-form or salver-shaped, the open throat more or less plaited. Anthers nearly sessile, included. Style short: stigma conical or capitate. Ovary 4-celled, in fruit splitting into 4 nutlets. Flowers small, in one-sided single or cymose-clustered spikes, mostly bractless.
13. HELIOPHYTUM. Corolla constricted at the throat. Style very short. Fruit mitre-shaped, splitting at maturity into 2 nutlets each 2-celled. Otherwise as in Heliotropium.

1. ÈCHIUM, VIPER'S BUGLOSS. (Name from Greek word for *viper.*)

E. vulgàre, Common V. or Blueweed. Cult. from Eu. in old gardens, and a weed in fields, Penn. to Virginia: 1°–2° high, very rough-bristly, with lanceolate sessile leaves, and showy flowers in racemed clusters, the purple corolla changing to bright blue, in summer. ②

2. BORRÀGO, BORAGE. (Old name, supposed corruption of *cor ago*, from imagined cordial properties.)

B. officinàlis, Common B. Cult. from Eu. in old gardens, spreading, branched, beset with sharp and whitish spreading bristles; leaves oval or oblong-lanceolate; flowers loosely racemed, handsome, blue or purplish, with dark anthers, in summer. ①

3. MERTÉNSIA. (Named for a *Prof. Mertens*, of Germany.) ♃

M. Virgínica, Virginian or Smooth Lungwort. Alluvial soil W. & S., and cult. for ornament: a *very smooth* and pale leafy plant, 1°–2° high, with obovate entire leaves, those of the root long-petioled, handsome flowers spreading or hanging on slender pedicels in loose raceme-like clusters, the light blue or at first purple corolla 1′ long: fl. spring.

4. ONOSMÒDIUM, FALSE GROMWELL. (Name means *like Onosma*, an European genus of this family.) Wild plants of the country, mostly in rich soil, in dry or alluvial ground: flowers leafy-bracted, greenish or yellowish-white, in summer. ♃

O. Virginiànum. Clothed with harsh but appressed short bristles, 1° – 2° high, with oblong leaves, and lance-awl-shaped lobes of narrow corolla sparingly bristly outside.

O. Caroliniànum. From New York W. & S.: shaggy with rough and spreading bristles, stout, 3° – 4° high, with lance-ovate or oblong-acute leaves, and lobes of rather broad corolla triangular and thickly hairy.

O. mólle. Only W.: hoary with softer and whitish appressed hairs, the oblong-ovate bluntish leaves strongly ribbed, and lobes of the triangular-pointed lobes of the narrow corolla thickly hairy outside.

5. LITHOSPÉRMUM, GROMWELL, PUCCOON. (Name from Greek, means *stony seed.*) Flowers in late spring and summer, at length scattered or as if spiked, leafy-bracted.

§ 1. *Corolla white or only yellowish in the wholly naked throat, scarcely longer than the calyx: nutlets rough-wrinkled and pitted, gray and dull.* ① ②

L. arvénse, CORN GROMWELL. Nat. from Eu. in waste dry soil, 6′ – 12′ high, roughish-hoary, with lanceolate or linear leaves and inconspicuous flowers.

§ 2. *Corolla dull whitish, rather short, with little downy scales or rather folds in the throat: nutlets smooth or with a few pores, often ivory-white.* ♃

L. angustifòlium. River-banks from Ill. S. & W.: minutely roughish-hoary, branched, 6′ – 15′ high, with linear rigid leaves, short peduncles recurved in fruit, and corolla not longer than calyx.

L. officinàle, COMMON G. of Europe, a weed by some roadsides: 1° – 2° high, branched above, with broadish-lanceolate acute leaves rough above but soft-downy beneath, and corolla longer than calyx.

L. latifòlium. From W. New York W. & S.: larger and rougher than the last, ovate and lance-ovate pointed leaves 2′ – 4′ long and prominently ribbed, those from the root larger and roundish; corolla shorter than calyx.

§ 3. *Corolla bright orange-yellow, showy, longer than calyx, almost salver-shaped, with little appendages in the throat evident: nutlets smooth, usually ivory-white.*

L. hírtum, HAIRY PUCCOON. Dry ground, chiefly S. & W.: 1° – 2° high, roughish-bristly, with lanceolate or linear leaves, or those next the flowers ovate-oblong and bristly-ciliate, the crowded flowers peduncled, tube of the corolla scarcely longer than the breadth of the border (¾′ – 1′) and woolly-bearded at base inside.

L. canéscens, HOARY P. Mostly N. & W.: softer-hairy and somewhat hoary, 6′ – 15′ high, smaller-flowered than the preceding, and tube of corolla smooth at base inside.

L. longiflòrum, only on prairies N. W., has linear leaves, and tube of corolla 1′ or more long, many times longer than the eroded-toothed lobes.

6. MYOSÒTIS, FORGET-ME-NOT or SCORPION-GRASS. (Name in Greek means *mouse-ear,* from the short soft leaves of some species.) Fl. spring and summer.

M. palústris, TRUE F., in gardens and some waste places, with loosely branched stems ascending from a creeping base, rough-pubescent lance-oblong leaves, moderately 5-cleft calyx shorter than the spreading pedicels, its hairs not hooked nor glandular, and its lobes open in fruit; corolla light blue with a yellow eye. — Var. LÁXA, wild in wet places N., has smaller flowers on still longer pedicels. ♃

M. árvensis. Not rare in fields, &c.: hirsute, with lance-oblong acutish leaves, racemes naked at base and stalked, small blue corolla, pedicels spreading in fruit and longer than the 5-cleft equal calyx, the lobes of which are closed in fruit, and the tube beset with some hooked or glandular-tipped hairs. ① ②

M. vérna. Dry hills: bristly-hirsute, erect (4′ – 10′ high), branched from base, with oblong and blunt leaves, racemes leafy at base, very small mostly white corolla, pedicels in fruit erect and appressed at base, but abruptly bent outwards near the apex, and rather shorter than the unequal very bristly calyx, some of its bristles hooked or glandular at their tip. ① ②

7. OMPHALÒDES. (Name from the Greek, refers to the navel-shaped depression on the upper face of the nutlets.) Cult. from Eu. for ornament.

O. vérna, BLUE or SPRING NAVELWORT. Spreading by leafy runners; leaves ovate or somewhat heart-shaped, 2′–3′ long, pointed, green; flowers azure-blue, in spring. ♃

O. linifòlia, WHITE N. Erect, 6′–12′ high, loosely branched, very pale or glaucous, with broadly lanceolate leaves sparingly ciliate, the upper sessile, white or bluish flowers, and turgid nutlets toothed around the margin of the cavity. ①

8. ECHINOSPÉRMUM, STICKSEED. (Name of two Greek words for *hedgehog* and *seed*, from the nutlets.)

E. Láppula. Weed of waste grounds, especially N., roughish-hairy, erect, 1°–2° high, with lanceolate leaves, small blue flowers, and nutlets with rough-tubercled back and thickly-prickled margins: fl. all summer. ①

9. CYNOGLÓSSUM, HOUNDSTONGUE (which the name means in Greek). Fl. summer. Nutlets form burs which adhere to fleece.

C. officinàle, COMMON H. Coarse weed from Europe, common in pastures and roadsides: leafy, soft-pubescent, with spatulate or lance-oblong leaves, the upper ones closely sessile, crimson purple corolla, and flat somewhat margined nutlets. ②

C. Virgínicum, WILD COMFREY. Rich woods: bristly-hairy; with simple stem leafless above and bearing a few corymbed naked racemes of blue flowers, the stem leaves lance-oblong with heart-shaped clasping base, the nutlets very convex. ♃

C. Morisòni, BEGGAR'S LICE. Thickets and open woods: a common weed, 2°–4° high, with slender widely spreading branches, thin oblong-ovate leaves tapering to both ends, forking and diverging racemes of very small whitish or bluish flowers on pedicels reflexed in fruit, and convex barbed-prickly small nutlets. ① ②

10. LYCÓPSIS, BUGLOSS. (Name of Greek words for *wolf* and *face* or *aspect*.) European weeds. Fl. summer. ①

L. arvénsis, FIELD or SMALL BUGLOSS. Very rough-bristly weed, about 1° high, in sandy fields E.; with lance-oblong leaves, and small blue corolla little exceeding the calyx.

11. SÝMPHYTUM, COMFREY. (From Greek word meaning to *grow together* or *unite*, alluding probably to supposed healing properties.) Cult. from Old World: fl. summer. ♃

S. officinàle, COMMON C. Rather soft-hairy; the branches winged by the decurrent bases of the oblong-lanceolate leaves; corolla yellowish-white. Naturalized sparingly in moist grounds.

S. aspérrimum, ROUGH C. Cult. in some gardens: stem and widely spreading branches excessively rough with short and somewhat recurved little prickles, not winged; calyx-lobes short; corolla reddish purple in bud changing to blue.

12. HELIOTRÒPIUM, HELIOTROPE (i. e., in Greek, *turning to the sun*). Fl. all summer.

* *Spikes only in pairs, or the lateral ones solitary: flowers white.* ①

H. Curassávicum. Sandy shores and banks from Virginia and Illinois S.: very smooth and pale; leaves oblong, spatulate, or lance-linear, thickish, veinless.

H. Europæum. Old gardens and waste places S., introduced from Eu.; hoary-downy, 6′–18′ high; leaves oval, long-petioled, veiny.

* * *Spikes collected in terminal and several times forked cymes: woody-stemmed or shrubby house and bedding plants from Peru and Chili.* ♃

H. Peruviànum, Sweet Heliotrope. Pubescent, with ovate-oblong or lance-ovate very veiny rugose leaves, and vanilla-scented pale blue-purple flowers.

H. corymbòsum. Cult. with the other, differs mainly in the larger and deeper-blue flowers of much less fragrance.

13. **HELIÓPHYTUM.** (Name of the Greek words for *sun* and *plant*, indicating the resemblance to Heliotrope.)

H. Índicum, Indian Heliotrope: hairy low plant, nat. from India as a weed in waste ground S.; with ovate heart-shaped leaves, and solitary spikes of small purplish flowers, in summer; a cavity before each seed-bearing cell of the 2-lobed fruit. ①

81. HYDROPHYLLACEÆ, WATERLEAF FAMILY.

Plants in some sort resembling both the foregoing and the following families, in the arrangement of the flowers more commonly imitating the former; differing from both in the 1-celled ovary and pod with 2 parietal placentæ. In some the placentæ unite in the axis, making a two-celled ovary. Style 2-cleft or else 2 separate styles. Ovules at least 2 to each placenta. Seeds with a small embryo in hard albumen. Juice inert and watery. Leaves mostly alternate, simple or compound. The following are all N. American plants, some wild, the others cult. for ornament from the West.

§ 1. *Style 2-cleft: ovary and pod 1-celled, with two parietal placentæ,*

* *These fleshy and so broad that they line the ovary, and enclose the (mostly 4) ovules and seeds: corolla usually convolute in the bud, commonly with 5 or 10 folds, scales, or other appendages down the inside of the tube.*

1. HYDROPHYLLUM. Calyx 5-parted, sometimes with small appendages at the sinuses, not enlarged in fruit. Corolla bell-shaped. Style and mostly hairy filaments protruded: anthers linear. Pod small, globose, ripening 1–4 spherical seeds. Flowers in crowded cymes or clusters. Leaves alternate, slender-petioled.
2. NEMOPHILA. Calyx 5-parted, and with a reflexed appendage in each sinus, somewhat enlarging in fruit. Corolla open bell-shaped or wheel-shaped, longer than the stamens. Flowers solitary and long-peduncled. Leaves mostly opposite, at least the lower ones.

* * *Placentæ narrow, adherent directly to the walls, or else borne on an incomplete partition and projecting into the cell, where they sometimes meet: lobes of the corolla imbricated in the bud.*

3. PHACELIA. Calyx 5-parted, the divisions narrow; no appendages at the sinuses. Corolla open bell-shaped, approaching wheel-shaped. Stamens and style often protruded. Pod 4–many-seeded. Leaves alternate. Flowers in one-sided raceme-like clusters or spikes.
4. WHITLAVIA. Corolla tubular-bell-shaped or slightly contracted at the throat, the 5 short and broad lobes abruptly and widely spreading. (Pod many-seeded.) Otherwise as the last section of Phacelia.

§ 2. *Styles 2 (rarely 3), separate quite to the base: ovary and pod 2-celled: seeds minute and very numerous.*

5. HYDROLEA. Calyx 5-parted. Corolla open-bell-shaped or approaching wheel-shaped, rather shorter than the stamens: filaments enlarged at base. Herbs, or somewhat shrubby, with entire leaves and often spines in their axils. Flowers in loose axillary clusters.

WIGANDIA, from South America, with very large rounded leaves and sharp or stinging bristles, is of late planted out as an ornamental leaf-plant, but is as yet uncommon.

1. HYDROPHÝLLUM, WATERLEAF, is a translation of the name from the Greek, the application obscure. Plants of rich woods, &c. Flowers white or bluish-tinged, in early summer. ♃

* *Calyx with minute appendages if any: rootstocks creeping, scaly-toothed.*

H. macrophýllum. From Ohio W. & S. W.: rough-hairy, with leaves pinnately divided into 9 – 13 cut-toothed divisions or leaflets; a globular cluster of flowers on a very long peduncle.

H. Virginicum. Very common N. & W.: smooth or smoothish, with 5 – 7 main divisions to the pinnate leaves, the lowest pair 2-parted, and calyx-lobes bristly-ciliate.

H. Canadénse. Chiefly N.: barely 1° high, nearly smooth, the roundish leaves palmately 5 – 7-lobed and with heart-shaped base, or some minute leaflets on the petioles, which are longer than the peduncles of the flower-cluster.

* * *Calyx with a conspicuous reflexed appendage in each sinus.*

H. appendiculàtum. From New York W. & S.: pubescent or hairy, with rounded palmately 5-lobed leaves or some of them pinnately divided, rather loose flower-clusters, and bristly-hairy calyx.

2. NEMÓPHILA. (Name from the Greek, means *lover of the grove.*) Low spreading plants cultivated for ornament; all but the first from California: fl. summer. ①

N. phacelioides. Wild from Arkansas S., and sparingly cult.; with ascending stems 1° – 2° long, alternate leaves pinnately parted into 3 – 9 oblong entire divisions, and purplish-blue corolla 1½′ broad.

N. insígnis. Slender, procumbent, with lobes of the pinnate leaves cut-toothed, and pure blue corolla 1′ broad.

N. maculàta. Prostrate, with leaves all opposite and mostly sessile, the lower lyrate-pinnatifid, upper sparingly cut-toothed, and white corolla with violet patch on each lobe.

N. atomària. Procumbent; leaves opposite, pinnatifid; corolla smaller, white sprinkled with chocolate-brown spots.

3. PHACÈLIA. (Name from Greek word for a cluster.) Several species cult. for ornament: fl. spring or summer.

§ 1. TRUE PHACELIA, *with only 4 ovules and seeds: lobes of corolla entire.*

P. congésta. Cult. from Texas, &c.: rather pubescent, with leaves pinnately divided or cleft into few oblong or ovate cut-toothed leaflets or lobes, and small blue flowers in 3 or 4 spikes at the summit of a slender peduncle; stamens slightly protruding. ①

P. tanacetifòlia, from California: taller, bristly-hairy, with narrower pinnatifid leaflets, larger flowers in longer dense spikes, and long stamens. ①

P. bipinnatífida. Wild from Ohio S. & W. in rich shady soil: 1° – 2° high, branched, glandular-hairy, with leaves twice pinnately divided into ovate cut-lobed leaflets, flowers slender pedicelled in long loose racemes, violet-blue corolla ½′ or more broad. ②

§ 2. COSMÁNTHUS, *with 4 ovules and seeds, and fringed lobes to corolla.* ① ②

P. Púrshii. Shady soil from Penn. W. & S. and cult. under the name of the next: slender, 8′ – 12′ high; lobes of pinnatifid leaves several, lance-oblong, acute; flowers of the raceme numerous, on slender pedicels; corolla light blue or whitish, ½′ broad; filaments hairy below.

P. fimbriàta, the true plant grows only in the high Alleghanies S., is smaller, with 3 – 7 rounded or oblong blunt divisions to the leaves, few and smaller white flowers.

§ 3. EÙTOCA, *with seeds or at least ovules several or many: corolla-lobes entire.*

P. parviflòra. Shaded banks from Penn. to N. Car.: scarce, delicate little plant, 3′ – 6′ high, with pinnately divided or cleft leaves, a raceme of few flowers on slender pedicels, bluish corolla less than ½′ wide, and few seeds. ②

P. víscida, cult. from California as EUTOCA VÍSCIDA: clammy all over with dark glandular hairs, rather coarse; leaves ovate, cut-toothed, short-petioled; racemes single terminating the branches; corolla deep blue, 1′ or less wide; pod many-seeded. ①

4. WHITLÀVIA. (Named by the lamented Professor Harvey for his friend *Mr. Whitla.*) Fl. summer. ①

W. grandiflòra. Cult. for ornament, from California: resembles Phacelia viscida in growth and foliage, but only slightly clammy, the roundish-ovate or slightly heart-shaped leaves coarsely toothed, on longer petioles; racemes loose; corolla 1′ or more long, violet-blue (also a white variety); stamens and style very slender and protruding.

5. HYDRÒLEA. (Named from Greek word for *water;* the plants aquatic or in wet places.) Fl. summer. ♃

H. quadriválvis, of S. E. States, has hairy stems; lanceolate acute leaves tapering to the base, and lanceolate sepals nearly as long as the corolla.

H. affìnis, of river-banks, from S. Illinois S., is smooth, with short-petioled lanceolate leaves, and ovate sepals as long as the corolla.

H. ovàta, of S. W. States, has soft-downy stems, ovate leaves, looser flowers, and lanceolate villous sepals.

82. POLEMONIACEÆ, POLEMONIUM FAMILY.

Chiefly herbs, with regular flowers, persistent 5-cleft calyx, the 5 lobes of the monopetalous corolla convolute in the bud, 3-lobed style, 3-celled ovary and pod; the single, few, or many seeds in each cell borne on the thick axis. Embryo straight in the axis of albumen. Insipid and innocent plants, the juice watery. Nearly all are N. American plants, many cult. for ornament.

§ 1. *Erect or diffuse herbs, not climbing, and with nothing resembling stipules.*

1. PHLOX. Calyx narrow, prismatic or plaited, 5-toothed or 5-cleft. Corolla salver-shaped, with a long tube (Lessons, p. 102, fig. 208), in which the 5 short and unequally inserted stamens are included. Ovary often with 2 ovules, but the short pod with only one seed in each cell. Leaves entire and mostly sessile, the lower all opposite, upper often alternate.
2. GILIA. Calyx tubular or bell-shaped, 5-cleft. Corolla of various shapes. Stamens equally inserted and projecting from the throat of the corolla, not declined. Ovules and seeds several in each cell. Leaves either entire, cut, or divided.
3. POLEMONIUM. Calyx bell-shaped. Corolla open-bell-shaped or short-funnel form. Stamens slender, like those of Gilia, but declined, hairy-appendaged at the base. Leaves pinnate, alternate.

§ 2. *Tall-climbing by compound tendrils on the pinnate leaves: lowest leaflets close to the stem, unlike the others, imitating stipules.*

4. COBÆA. Calyx of 5 large leaf-like divisions, the margins of which, applied each to each, appear like 5 winged angles. Corolla bell-shaped, with short and broad spreading lobes. Stamens declined. A fleshy disk around the base of the ovary. Seeds numerous in each cell of the pod, winged. Peduncles axillary, 1-flowered, leafy-bracted near the base, naked above. Leaves alternate.

1. PHLÓX. (Greek for *flame,* anciently applied to Lychnis, and transferred to these North American plants.)

§ 1. ① *Cultivated for ornament from Texas: fl. all summer.*

P. Drummóndii. From this come all the annual Phloxes of the gardens: rather low, branching and spreading, somewhat clammy-pubescent, with corymbs of purple, crimson, rose-colored, or even white, showy flowers.

§ 2. ♃ *Wild in mostly dry or rocky ground, also common in gardens, where the species are much crossed and varied.*

* *Stems erect: flowers in oblong or pyramidal panicle, with short peduncles and pedicels: lobes of corolla entire, pink-purple, and with white varieties. Wild from Pennsylvania S. and W.: fl. summer.*

P. paniculàta. Smooth, or some varieties roughish or soft hairy, 2°–4° high, stout; leaves oblong or ovate-lanceolate and mostly with tapering base; panicle broad; calyx-teeth sharp-pointed.

P. maculàta. Smooth; stem slender, 1°–2° high, purple-spotted lower leaves lanceolate, upper lance-ovate from a rounded or somewhat heart-shaped base; panicle long and narrow, leafy below; calyx-teeth hardly pointed.

* * *Stems ascending or erect, but often with a prostrate base, 1°–3° high: whole plant smooth, not clammy nor glandular: flowers corymbed: lobes of corolla round and entire. Wild chiefly W. and S., seldom cult.: fl. summer.*

P. Carolina. Leaves varying from lanceolate to ovate, or the upper heart-shaped; flowers crowded, short-peduncled, pink; calyx-teeth acute.

P. glabérrima. Slender; leaves often linear-lanceolate, 3′–4′ long; flowers fewer and loose, pink or whitish; calyx-teeth sharp-pointed.

* * * *Flowering stems ascending, or in the first erect, low, terminated by a loose corymb, which is clammy-pubescent more or less, as well as the thinnish leaves: flowers mostly pedicelled: calyx-teeth very slender: fl. late spring.*

P. pilòsa. From N. Jersey to Wisconsin & S.: mostly hairy; erect stems 1° or so high; leaves lanceolate or linear and tapering to a point (1′–2½′ long); flowers loose, with spreading awn-pointed calyx-teeth; lobes of pink, rose, or rarely white corolla obovate and entire.

P. amœna. Barrens from Virg. to Ill. & S.: pubescent, spreading from the base, 6′–1° high, leaves lanceolate, or broadly oblong or ovate on sterile shoots, short; flowers in a crowded leafy-bracted corymb, with straight hardly awn-pointed calyx-teeth; corolla purple, pink, or nearly white.

P. réptans. Moist woods from Penn. and Kentucky S.: spreading by long runners, which bear round-obovate often smoothish leaves, those of the low flowering stems oblong or ovate (about ½′ long); flowers few but crowded; lobes of the deep pink-purple corolla round-obovate, large (1′ broad).

P. divaricàta. Moist woods from N. New York W. & S.: soft-pubescent; stems loosely spreading; leaves ovate-oblong or broad-lanceolate (1′–2′ long); flowers loosely corymbed and peduncled; corolla large, pale lilac, bluish, or lead-colored, the lobes wedge-obovate or commonly inversely heart-shaped and as long as the tube.

* * * * *Stems creeping and tufted, rising little above the ground, almost woody, persistent, as are the rigid and crowded glandular-pubescent leaves: flowers few in the depressed clusters, in early spring.*

P. subulàta, Ground or Moss Pink. Wild on rocky hills W. & S. of New England, and common in gardens, forming broad mats; leaves awl-shaped or lanceolate, at most ½′ long; corolla pink-purple, rose with a darker eye, or varying to white, the wedge-obovate lobes generally notched at the end.

2. GÍLIA. (Named for one *Gil*, a Spanish botanist.) Species abound from Texas and Kansas to California. Several are choice annuals of the gardens: fl. summer.

G. coronopifòlia, or Ipomopsis, called Cypress Gilia from the foliage resembling that of Cypress-Vine: wild S. and cult.; has erect wand-like stem 2°–3° high, thickly clothed with alternate crowded leaves pinnately divided into thread-like leaflets, and very long and narrow strict leafy panicle of showy flowers; the corolla tubular-funnel form, light scarlet with whitish specks on the lobes inside, 1½′ long. (*Lessons, p. 101, fig. 201.*) ②

G. androsàcea, or Leptosiphon androsaceus, of California; low and slender, with opposite leaves palmately cleft into 5–7 narrow linear divisions, a head-like cluster of flowers with very long and slender but small salver-shaped corolla, lilac or whitish with a dark eye. ①

G. tricolor, of California: with branching stems, about 1° high, scattered alternate leaves 2–3 times pinnately dissected into short linear divisions, flowers panicled at the end of the branches, short funnel-form corolla with lilac-purple or whitish lobes, brown-purple throat, and yellow tube. ①

G. capitàta, of California and Oregon; 1°–2° high, with alternate leaves twice pinnately divided into small linear or thread-like leaflets or lobes, and numerous small blue flowers crowded in heads at the end of naked branches; the corolla narrow funnel-form with lanceolate lobes. ①

3. POLEMÒNIUM, GREEK VALERIAN, JACOB'S LADDER. (Ancient name, from the Greek word for *war*, or in honor of a philosopher or king named *Polemon*.) Fl. early summer. ♃

P. rèptans. Woods of Middle States, also cult.: smooth, with weak and spreading (but never creeping) stems 6′–10′ long, 7–11 lance-ovate or oblong leaflets, small corymbs of nodding light blue flowers, and stamens and style not longer than the corolla.

P. cærùleum. Cult. in gardens from Eu., also rarely wild N.: smooth or sometimes hairy; with erect stem 1°–3° high, 9–21 mostly lanceolate and crowded leaflets, clusters of bright blue flowers collected in a long panicle, and stamens and style longer than the lobes of the corolla, which is 1′ broad.

4. COBÆ̀A. (Named for one *Cobo*, a Spanish priest in Mexico, from which country the common species was introduced into cultivation.) ♃

C. scàndens. Smooth, tall-climbing by its much branching tendrils; leaflets ovate; dull purple or greenish corolla 2′ or more long, long filaments coiling spirally when old: fl. all summer, usually cult. as an annual.

83. CONVOLVULACEÆ, CONVOLVULUS FAMILY.

Twining, trailing, or rarely erect plants, (ours herbs,) commonly with some milky juice, alternate leaves, no stipules; regular monopetalous flowers with 5 (rarely 4,) imbricated sepals, as many separate stamens, corolla convolute or twisted in the bud, a 2–4-celled ovary and pod with only 1 or 2 ovules erect from the base of each cell, becoming large seeds, containing a curved or coiled conspicuous embryo in some mucilaginous (or when dry, harder) albumen.

I. CONVOLVULUS FAMILY PROPER; with ordinary foliage, axillary peduncles bearing one or more usually showy flowers, and embryo with broad leaf-like cotyledons folded and crumpled in the seed. (Lessons, p. 14, fig. 25–28.) Calyx of 5 separate sepals.

§ 1. *Style single and entire: stigmas* 1–3.

* *Calyx naked, i. e. not enclosed by a pair of leafy bracts.*

1. QUAMOCLIT. Corolla nearly salver-shaped or trumpet-shaped, with a long tube, the border not twisted in the bud. Stamens and style commonly protruded. Stigma capitate, more or less 2-lobed. Pod 4-celled: cells 1-seeded. (Lessons, p. 101, fig. 202, 203.)
2. IPOMŒA. Corolla various, more commonly funnel-form, the border twisted in the bud. Stamens mostly included. Stigma capitate, commonly 2–3-lobed. Pod 2–4-celled.
3. CONVOLVULUS. Corolla open funnel-form or almost bell-shaped. Stamens included. Stigmas 2, linear. Pod 2-celled: cells 2-seeded.

* * *Calyx surrounded and enclosed by a pair of large leafy heart-shaped bracts.*

4. CALYSTEGIA. Corolla open funnel-form, the wide-spreading border obscurely lobed or entire. Stamens included. Style bearing 2 linear or oblong stigmas. Pod 4-seeded. Peduncles 1-flowered.

§ 2. *Style 2-cleft or 2 separate styles, rarely 3. Spreading or trailing, not twining.*

5. BONAMIA. Like Convolvulus, but the styles 2 or sometimes 3, or in one species 2-cleft, and stigmas capitate. Peduncles 1-7-flowered.

6. EVOLVULUS. Corolla short and open funnel-form, or almost wheel-shaped. Styles 2, each 2-cleft: the 4 stigmas obtuse. Pod 2-celled: cells 2-seeded.

II. DODDER FAMILY; slender parasitic twiners, without green herbage and with only some minute scales in place of leaves; embryo slender and spirally coiled in the seed, destitute of cotyledons.

7. CUSCUTA. Calyx 4-5-cleft, or of 5 separate sepals. Corolla short, 4-5-cleft. Stamens with a scale-like mostly fringed appendage at their base. Styles 2 in our species. Ovary 2-celled: cells 2-ovuled. Pod commonly 4-seeded.

1. **QUÁMOCLIT.** (Aboriginal Mexican name.) Twiners, with small flowers red or crimson, and with pale or white cultivated varieties, in summer, open through the day. ①

Q. vulgàris, CYPRESS-VINE. Cult. from Mexico: leaves pinnately parted into slender almost thread-shaped divisions; peduncles 1-flowered; border of the narrow corolla 5-lobed.

Q. coccínea. Run wild S. & W.: leaves heart-shaped, pointed; sepals awn-pointed; peduncles several-flowered; border of (1′ long) corolla merely 5-angled.

2. **IPOMŒA,** MORNING GLORY. (Greek-made name.) Fl. summer.

§ 1. *Ovary and pod 3-celled (or accidentally 4-celled), with 2 seeds in each cell: stigma more or less 3-lobed: corolla funnel-form, opening in early morning for a few hours: stems twining freely, hairy, the hairs more or less retrorse.*

I. purpùrea, COMMON M. Cult. from Trop. Amer. and wild around dwellings; with heart-shaped pointed entire leaves, 3-4-flowered peduncles, and purple sometimes variegated or nearly white corolla, 2′ long. ①

I. Nil. Cult. or run wild S.: with heart-shaped 3-lobed leaves, 1-3-flowered peduncles, slender-pointed sepals, and blue-purple or sometimes white corolla 1′-2′ long. ①

I. limbàta or **albo-marginàta,** perhaps a var. of the preceding, a tender species, with leaves little lobed, angled or entire, and larger corolla with deep violet border, edged with white $2\frac{1}{2}'$ broad. ①

I. Leàrii, cult. from S. Amer.: tender, less hairy, with heart-shaped and some deeply 3-lobed leaves, many flowers crowded on the summit of the peduncle, and deep violet-blue corolla, 3′ long and border 3′ wide. ♃

§ 2. *Ovary and pod 2-celled, the cells 2-seeded, or sometimes each cell divided by a partition making 4 one-seeded cells: lobes of the stigma if any only 2.*

I. Bona-Nóx, or CALONYCTION SPECIÒSUM. Cult., also wild far S.: tall-twining, very smooth, but stems often beset with soft almost prickly projections; leaves heart-shaped, halberd-shaped, or angled; peduncles long, 1-few-flowered; corolla salver-form with a slender tube 3′-4′ long and the border still broader, white, opening at evening.

I. Batàtas, SWEET POTATO. Cult. from East Indies: creeping, seldom twining, smooth, producing the large fleshy edible roots for which the plant is cultivated; leaves variously heart-shaped, halberd-shaped, or triangular, sometimes cut-lobed; peduncles bearing 3 or 4 flowers; corolla funnel-form, purple, $1\frac{1}{2}'$ long; pod with 4 one-seeded cells. ♃

I. Michaúxii. Light soil along the coast S.: *creeping or twining*, with heart-shaped or triangular sometimes lobed leaves downy beneath; flowers downy; corolla purplish-white with purple eye, 3′-4′ long, opening at night; pod partly 4-celled, with silky seeds; root extremely large and fleshy. ♃

I. panduràta, Wild Potato-Vine or Man-of-the-Earth. Sandy or gravelly soil, Conn. to Ill. & S.: trailing or twining, stout, smooth, with heart-shaped and sometimes fiddle-shaped or halberd-3-lobed leaves, 1 – 5-flowered peduncles, small bracts, and open funnel-form white corolla with deep purple eye, 2′ – 3′ long; root very large and deep. ♃

I. sagittifòlia. Salt-marshes, from North Carolina S.: smooth, with stems twining 2° – 3° high, or trailing, narrow lanceolate or linear long-sagittate leaves, 1 – 3-flowered club-shaped peduncles, and the bright purple funnel-form corolla 2′ – 3′ long. ♃

I. lacunòsa. Low grounds, Penn. to Ill. and S.: twining, nearly smooth, with heart-shaped nearly entire leaves, short 1 – 3-flowered peduncles, small white 5-lobed corolla about ½′ long and twice the length of the pointed ciliate sepals, and slightly hairy pod. ①

I. commutàta. Low grounds S. & W.: rather hairy, twining; with thin heart-shaped and sometimes angled or 3 – 5-lobed leaves, 4-angled 1 – 5-flowered peduncles about the length of the slender petioles; purple corolla 1′ – 2′ long and 4 – 5 times the length of the pointed ciliate sepals; pod hairy.

3. CONVÓLVULUS, BINDWEED. (From Latin *convolvo*, to roll around or twine.) Fl. summer.

C. arvénsis, Field Bindweed of Eu., is a weed on the coast E.: spreading and low-twining, smoothish; leaves ovate-oblong and narrow-shaped; peduncles 1-flowered; corolla white tinged reddish, less than 1′ long. ♃

C. trícolor. Cult. from S. Europe in gardens; hairy, low, with ascending branching stems, lance-obovate or spatulate almost sessile leaves, 1-flowered peduncles, rather large and showy flowers opening in sunshine, the corolla blue with pale or white throat and yellow tube. ①

4. CALYSTÈGIA, BRACTED BINDWEED. (From Greek words denoting the *calyx covered*, that is, by the bracts.) Fl. all summer.

C. sèpium, Hedge B. Wild in low grounds, also planted: twining freely, sometimes also trailing, spreading by running rootstocks; smooth, also a downy variety; leaves triangular and halberd-shaped or arrow-shaped, with the lobes at base obliquely truncate and sometimes toothed or sinuate; peduncles 4-angled; corolla white or light rose-colored, 1½′ – 2′ long. ♃

C. spithamæa. Dry sterile ground; downy, not twining, 6′ – 12′ high; leaves oblong, some of them more or less auricled or heart-shaped at the base; corolla white, 2′ long. ♃

5. BONÁMIA. (Named for *F. Bonamy*.) Low, small-flowered: corolla more or less silky or hairy outside: fl. summer: chiefly S. ♃

B. humistràta. Dry pine barrens from Virg. S.: sparsely hairy or smoothish; leaves varying from oblong with heart-shaped base to linear; sepals smooth; corolla white, almost 1′ long; filaments hairy; styles united at base.

B. aquática. Along ponds S.: finely soft-downy; leaves varying as in the preceding; sepals silky; corolla pink or purple ½′ long; filaments smooth; styles nearly separate.

B. Pickeríngii. Sandy barrens from N. Jersey S., scarce: leaves nearly linear, narrow, tapering to a sessile base; bracts leaf-like and longer than the flowers; sepals hairy; corolla white, hardly ½′ long; styles united to above the middle, and with stamens also protruding.

6. EVÓLVULUS. (From Latin for *unroll*, that is, it does not twine.) Low and diminutive small-flowered plants, only S. Fl. summer. ♃

E. argénteus. Dry ground from Missouri S.: tufted from a woody base, 5′ – 7′ high, silky-woolly all over; broadly lanceolate leaves crowded, mostly nearly sessile, as are the flowers in their axils; corolla purple; ¼′ broad.

E. serícеus. Damp ground S. & S. W.: slender-stemmed, silky with fine appressed hairs, except the upper face of the scattered lance-linear leaves, corolla white or bluish, not ½′ broad.

7. **CÚSCUTA,** DODDER. (Old name, of uncertain derivation.) Plants resemble threads of yarn, yellowish or reddish, spreading over herbs and low bushes, coiling around their branches, which they adhere to and rob of their juices. Flowers small, mostly white, clustered.

§ 1. *Stigmas slender; pod opening by a transverse division all round near the base, leaving the partition behind. Natives of Europe: fl. early summer.*

C. Epílinum, Flax Dodder. Growing on flax, which it injures; occasionally found in our flax-fields; flowers globular, in scattered heads; corolla 5-parted. ①

§ 2. *Stigmas capitate: pods bursting irregularly if at all: wild species of the country, mostly in rich or low ground: fl. summer and autumn.* ①

* *Flowers in rather loose clusters, mostly short-pedicelled, the scaly bracts few and scattered: calyx 4 – 5-cleft.*

+ *Corolla with cylindrical tube, in fruit covering the top of the pod.*

C. tenuiflòra. On shrubs and tall herbs from N. Jersey W. & S., in swamps: pale; tube of the corolla twice the length of its ovate acute spreading lobes and of the ovate blunt calyx-lobes.

C. infléxa. On shrubs and tall herbs in prairies and barrens W. & S.: corolla fleshy, mostly 4-cleft, its tube no longer than the ovate acutish crenulate erect or inflexed lobes of the corolla and the acute keeled calyx-lobes.

C. decòra. Wet prairies S. W.: with larger flowers, the corolla broadly bell-shaped, its 5 lobes lance-ovate and acute.

++ *Corolla bell-shaped, remaining at the base of the ripe pod.*

C. arvénsis. On low herbs, in fields and barrens from New York to Ill. & S. W.: flowers earliest (June, July) and smallest; tube of corolla shorter than its 5 lanceolate pointed spreading lobes, much longer than the stamens.

C. chlorocárpa. On low herbs, in wet soil, from Delaware W. & S.W.: orange-colored; open bell-shaped corolla with lobes about the length of the mostly 4 acute lobes and the stamens; pod large, depressed, greenish-yellow.

C. Gronòvii. The commonest E. & W. and the only one N. E.; on coarse herbs and low shrubs in wet places; bell-shaped corolla with tube usually longer than its 5 (rarely 4) ovate blunt spreading lobes; its internal scales large and copiously fringed.

* * *Flowers sessile in compact mostly continuous clusters, making large bunches or close matted coils, when old resembling pieces of rope twisted around the stems of coarse herbs or shrubs: calyx of separate sepals surrounded by similar crowded bracts: remains of the corolla borne on the top of the ripe pod.*

C. compácta. On shrubs, from N. York S. & W.: bracts (3 – 5) and sepals round and appressed; tube of corolla cylindrical.

C. glomeràta. On Golden rods and other coarse Compositæ, from Ohio W. & S. W.: the numerous oblong scarious bracts closely imbricated with recurving tips; sepals similar, shorter than the cylindraceous tube of the corolla.

84. SOLANACEÆ, NIGHTSHADE FAMILY.

Plants with rank-scented herbage (this and the fruit more commonly narcotic-poisonous, colorless juice), alternate leaves (but apt to be in pairs and unequal), regular flowers with the parts usually in fives, but the ovary mostly 2-celled, the many-seeded placentæ in the axis. The seeds have a slender usually curved embryo in fleshy albumen. (Lessons, p. 15, fig. 34, 35.) The order runs on the one hand into Scrophulariaceæ, which a few species approach in a somewhat irregular corolla, but their stamens are as many as the lobes. On the other hand the Nolana group is appended, which differs from all in its separate ovaries around a common style.

I. NOLANA FAMILY, with few or many separate ovaries collected in a circle or heap around the base of a single style. Low and spreading plants.

1. NOLANA. Calyx 5-cleft, foliaceous. Corolla short and open funnel-form, plaited in the bud. Stamens 5. Style 1: stigma capitate or club-shaped. Ovaries 3-40, becoming 1-4-celled drupelets or nutlets, each cell 1-seeded.

II. NIGHTSHADE FAMILY PROPER, with only one 2-celled or sometimes 3-5-celled ovary as well as style, the many-seeded placentæ in the axis, usually much projecting into the cell.

§ 1. *Corolla wheel-shaped, lobed or parted into 5 or sometimes more divisions, plaited and valvate or the margins turned inwards in the bud: the tube very short: anthers conniving around the style: fruit a berry.*

2. LYCOPERSICUM. Like Solanum, except that the anthers are united by a membrane at their tips and the cells open lengthwise. Leaves pinnately compound.
3. SOLANUM. Stamens with anthers equalling or mostly longer than the very short filaments, usually not united, the cells opening by a hole at the apex. (Lessons, p. 101, fig. 204, 205.) Leaves simple or pinnate.
4. CAPSICUM. Stamens with slender filaments much longer than the short and separate commonly heart-shaped anthers, their cells opening lengthwise. Berry sometimes dry and inflated, then becoming 1-celled.

§ 2. *Corolla between wheel-shaped and funnel-form, plaited in the bud, the border very moderately if at all lobed: anthers separate, opening lengthwise: calyx bladdery-inflated after flowering, enclosing the globular berry.*

5. PHYSALIS. Calyx 5-cleft. Corolla mostly somewhat 5-lobed. (Lessons, p. 101, fig. 206.) Stamens erect. Fruit a juicy, often edible, 2-celled berry.
6. NICANDRA. Calyx 5-parted and angled, the divisions somewhat arrow-shaped. Corolla with widely-spreading border almost entire. Fruit a dry 3-5-celled berry.

§ 3. *Corolla bell-shaped, funnel-form, tubular, or salver-shaped: anthers separate, opening lengthwise: calyx not bladdery-inflated.*

* *Calyx urn-shaped in fruit, enclosing the pod: corolla considerably irregular.*

7. HYOSCYAMUS. Calyx 5-lobed, the spreading border becoming reticulated, enclosing the 2-celled pod, which opens by the top falling off as a lid. Corolla short funnel-form, with the plaited border more or less oblique and unequal. Stamens declined.

* * *Calyx 5-parted to near the base, the lobes foliaceous.*

8. ATROPA. Calyx with ovate divisions, in fruit enlarging and spreading under the globose purple berry. Corolla between bell-shaped and funnel-form, with 5 triangular-ovate lobes. Stamens and style somewhat declined, slender.
9. PETUNIA. Calyx with narrow somewhat spatulate lobes much longer than the tube. Corolla funnel-form or somewhat salver-shaped, the 5-lobed border commonly a little unequal. Stamens included in the tube, unequal. Pod 2-celled, 2-valved.

* * * *Calyx tubular, prismatic, or bell-shaped,*

+ *Covering the dry pod or nearly so: corolla salver-shaped or funnel-form, the lobes plaited in the bud: seeds minute.*

10. NIEREMBERGIA. Corolla with very slender thread-like tube (½′-1′ long), abruptly expanded at the narrow throat into a saucer-shaped or almost wheel-shaped 5-lobed border. Stamens short, borne on the throat. Stigma kidney-shaped and somewhat 2-lipped. Flowers scattered.
11. NICOTIANA. Corolla with a regular 5-lobed border. Stamens inserted on its tube, included: filaments straight. Stigma capitate. Pod 2-4-valved from the apex. Flowers more or less racemed or panicled.

+ + *Calyx prismatic, falling away after flowering, leaving the 2-4-celled pod naked.*

12. DATURA. Corolla funnel-form, strongly plaited in the bud, and with 5 or more pointed teeth. (Lessons, p. 100, fig. 199; p. 110, fig. 225.) Filaments

slender. Stigma somewhat 2-lobed or 2-lipped. Pod globular, in the common species prickly and 4-celled, but the 2 placentæ-bearing or false partitions often incomplete. Seeds large and flat, somewhat kidney-shaped. Flowers terminal or in the forks.

+ + + *Calyx bell-shaped, cup-shaped, or short-tubular, in fruit persistent under or partly covering the 2-celled berry; shrubs, with entire feather-veined leaves.*

13. CESTRUM. Corolla tubular-funnel-form or club-shaped, the lobes folded or plaited lengthwise in the bud. Stamens included. Stigma capitate. Ovary with few ovules in each cell. Berry few-seeded. Flowers in clusters.

14. LYCIUM. Parts of the flower often in fours. Corolla funnel-form, bell-shaped or tubular, the lobes imbricated in the bud. Stigma capitate. Berry many-seeded, red or reddish. Flowers solitary or umbelled, lateral.

1. NOLÀNA. (From Latin *nola*, a little bell.) Cult. for ornament, from coast of Peru and Chili; the following procumbent and spreading, rather fleshy-leaved, smooth except some scattered hairs on the stalks, the showy blue flowers solitary on axillary or lateral peduncles, opening in sunshine, all summer.

N. atriplicifòlia, with obovate or broadly spatulate leaves (resembling those of Spinach, whence the specific name); sky-blue corolla 2′ wide with white and yellowish centre; ovaries numerous in a heap, each 1-celled and 1-seeded. ①

N. prostràta, now less common, has more petioled rather narrower leaves, smaller pale violet-blue flower striped with purple, and few ovaries each of 2–4 cells. ①

2. LYCOPÉRSICUM, TOMATO. (Name in Greek means *wolf-peach*, no obvious application.) Fl. summer.

L. esculéntum, TOMATO, cult. from trop. America, includes the manifold varieties and forms; hairy, rank-scented; leaves interruptedly pinnate, larger leaflets cut or pinnatifid; flowers yellowish, by cultivation having their parts often increased in number, the esculent red berry becoming several celled. ①

3. SOLÀNUM, NIGHTSHADE, &c. (Derivation uncertain.) Flowers mostly in corymb or raceme-like clusters, in summer.

§ 1. *More or less prickly herbs, with acute elongated-lanceolate anthers.*

* *Very prickly calyx enclosing the dry berry: anthers declined, unequal, one of them much longer than the rest, leaves sinuately once to thrice pinnatifid.* ①

S. rostràtum. Wild on plains W. of Mississippi, and becoming a weed in some gardens, has yellow flowers, 1′–1½′ in diameter.

S. heterodòxum. Wild S. W. beyond the Mississippi, sometimes cult. for ornament, has violet-blue flowers, and the more divided leaves resemble those of Watermelon, but are very prickly.

* * *Calyx mostly somewhat prickly but not enclosing the fruit: anthers nearly equal.*

S. Carolinénse, HORSE-NETTLE. Wild weed in sandy soil from Conn. S.: roughish-downy, 1° high, with ovate-oblong angled or sinuate-lobed leaves, yellowish prickles, and pale blue or white flowers almost 1′ wide. ♃

S. aculeatíssimum. Weed introduced into waste places S., 1°–2° high, bristly hairy, greener and more prickly than the foregoing, with smaller white flowers. ①

S. Melongèna, EGG PLANT, AUBERGINE. Cult. for the large oblong or ovate violet-colored or white esculent fruit (2′–6′ long); leaves ovate, rather downy, obscurely sinuate; corolla violet with yellow eye. ①

§ 2. *Plants not at all prickly: anthers blunt.*

S. nigrum, BLACK or COMMON NIGHTSHADE. Low weed of shady grounds, much branched, nearly smooth, with ovate wavy-toothed or sinuate leaves, very small white flowers, and globular black berries said to be poisonous. ①

S. tuberòsum, Potato. Cult. from Chili for the esculent tubers; leaves pinnate, of several ovate leaflets and some minute ones intermixed; flowers blue or white; berries round, green. ♃

S. Dulcamàra, Bittersweet. Nat. from Eu. in moist cult. and waste grounds; smoothish, with tall stems woody at base and disposed to climb, ovate and heart-shaped leaves, some of the upper ones halberd-3-lobed, or with one or two pairs of smaller leaflets or lobes at base, corolla violet-purple with a pair of greenish spots on the base of each lobe, and oval red berries. ♃

S. jasminoìdes. Woody-stemmed house-plant from Brazil, tall-climbing by its petioles, very smooth, with oblong ovate or slightly heart-shaped entire leaves, or some of them divided into 3 leaflets, and clusters of white or bluish flowers. ♃

S. Pseudo-Cápsicum, Jerusalem Cherry. Shrubby house-plant from Madeira, cult. for the ornamental bright red berries, resembling cherries; smooth, with lance-oblong entire leaves and small white flowers. ♃

4. CÁPSICUM, CAYENNE or RED PEPPER. (Said to come from Greek word meaning to gobble or eat quickly.) Originally all South American. Fl. summer.

C. ánnuum, Common C. Cult. for the large oblong or globular and often angled dry berry (red or green), which is exceedingly pungent, and used as a condiment; leaves ovate, entire; flowers white, with truncate calyx. ①

C. cerasifórme, is cult. rarely as a pepper, more commonly for the ornamental cherry-like fruit, either bright red or yellow; stem shrubby. ♃

5. PHÝSALIS, GROUND CHERRY. (Greek name for *bladdery*, from the inflated fruiting calyx.) Fl. summer.

§ 1. *Low stems (6′–20′ high) from slender creeping rootstocks: anthers yellow: fruiting calyx loosely inflated, 5-angled, much larger than the edible berry. All but the first are wild species of the country, in light or sandy soil.* ♃

P. Alkekéngi, Strawberry Tomato. Cult. from S. Eu., and running wild E.: rather downy; leaves triangular-ovate, pointed; corolla greenish-white, 5-lobed, not spotted; fruiting calyx ovate, turning red; berry red.

P. Pennsylvánica. Smooth or somewhat hairy, but not clammy; leaves varying from ovate to lanceolate (var. lanceolàta), entire or sparingly wavy-toothed; corolla yellowish with a darker throat and slightly 5–10-toothed border; fruiting calyx sunken at the base; berry red.

P. viscòsa. Clammy-pubescent, much branched, bushy; leaves ovate or heart-shaped and mostly toothed; corolla light yellow with dark brown centre; fruiting calyx truncate or slightly concave at base, sharply 5-angled; berry orange or reddish, glutinous.

§ 2. *Stems 1°–3° high, from an annual root: flowers small, light greenish-yellow: anthers tinged with blue or violet. Wild species in low or cult. grounds.* ①

P. pubéscens. Clammy-hairy or downy; stems much spreading; leaves ovate or heart-shaped, angulate-toothed; corolla brown-spotted in the throat; sharply 5-angled fruiting calyx loosely enclosing the yellow or greenish berry.

P. angulàta. Nearly smooth; leaves more sharply cut-toothed; peduncles slender, very small corolla not spotted; fruiting calyx 10-angled, loose, at length filled by the greenish-yellow berry.

P. Philadélphica. Almost smooth, erect; leaves ovate or oblong and oblique at base, slightly toothed or angled; corolla dark colored in the throat, over ½′ wide; fruiting calyx globose, completely filled by the large reddish or purple edible berry, and open at the mouth.

6. NICÁNDRA, APPLE-OF-PERU. (Named from the poet *Nicander*?) Only one species: fl. summer. ①

N. physaloides. Tall smooth weed from Peru, wild in moist waste grounds; with ovate angled or sinuate-toothed leaves, and solitary peduncles, bearing a rather large pale blue flower.

7. HYOSCYAMUS, HENBANE. (Name of the Greek words for *hog* and *bean*.) Fl. summer. ① ②

H. niger, Black Henbane, of Europe, cult. in old gardens, and a weed in waste places: clammy-downy, strong-scented, narcotic-poisonous; with clasping sinuate-toothed leaves, sessile flowers in one-sided leafy-bracted spikes, and dull yellowish corolla netted-veiny with purple.

8. ÁTROPA, BELLADONNA. (Named after one of the Fates.) ♃

A. Belladónna, the only species, sparingly cult. from Europe: low and spreading, nearly smooth, with ovate entire pointed leaves, flowers single or in pairs nodding on lateral peduncles, dull-purple corolla, and handsome purple berry; whole plant poisonous, used in medicine.

9. PETÙNIA. (*Petun* is an aboriginal name of *Tobacco.*) Cultivated as garden-annuals, from South America. The common Petunias are of the two following species and their hybrids: herbage clammy-pubescent; flowers large and showy, in summer.

P. nyctaginiflòra, with originally white corolla, the long narrow tube 3 or 4 times the length of the calyx.

P. violàcea, now much the more common, with weaker stems, and violet-purple or rose-red corolla, the broader and ventricose tube hardly twice the length of the calyx.

10. NIEREMBÉRGIA. (Named for *J. Nieremberg*, a priest and botanical collector in Buenos Ayres, whence the common species comes.) ♃ ①

N. grácilis. Cult. for ornament under many varieties, low, with slender bushy branches, small linear or spatulate-linear leaves, and scattered flowers produced all summer, white or veined or tinged with purple.

11. NICOTIÀNA, TOBACCO. (Named for *John Nicot*, one of the introducers of Tobacco into Europe.) Rank, acrid-narcotic, mostly clammy-pubescent plants, chiefly of America; leaves entire or merely wavy-margined. Fl. summer.

N. Tabácum, Common T., the principal species cult. for the foliage: 4°–6° high, with lance-ovate decurrent leaves 1°–2° long, or the upper lanceolate, panicled flowers, and rose-purple funnel-form corolla 2′ long, with somewhat inflated throat and short lobes. ①

N. rústica, a weed in some places, is a low homely plant, with ovate and petioled leaves 2′–5′ long, and green funnel-form corolla (1′ long) contracted under the short round lobes. ①

N. longiflòra, is slender, 2°–3° high, cult. for its handsome white flowers, which open toward evening; corolla salver-shaped, the green tube 4′ and the lance-ovate acute lobes ½′ long; leaves lanceolate, undulate. ①

N. noctiflòra, its handsome white flowers also opening at evening (as the name denotes), is similar to last, but with ovate-lanceolate petioled leaves, tube of corolla only 2′–3′ long, and its roundish lobes notched at the end. ①

12. DATÙRA, THORN-APPLE, STRAMONIUM, &c. (Name altered from the Arabic.) Rank-scented, mostly large-flowered, narcotic-poisonous weeds, or some ornamental in cultivation: fl. summer.

§ 1. *Flower and the usually prickly 4-valved pod erect, the latter resting on a plate or saucer-shaped body which is the persistent base of the calyx, the whole upper part of which falls off entire after flowering: corolla with a 5-toothed border.* ①

D. Stramònium, Common T. or Jamestown-Weed. Waste grounds: smooth, with green stems and white flowers (3′ long); leaves ovate, angled, or sinuate-toothed.

D. Tátula, Purple T. A weed very like the other, but rather taller, with purple stem and pale violet-purple flowers.

§ 2. *Pod nodding on the short recurved peduncle, rather fleshy, bursting irregularly, otherwise as in the foregoing section: flowers large, showy. Cult. from warm regions for ornament.* ① ♃

D. Mètel. Clammy-pubescent; leaves ovate, entire or obscurely angled-toothed; corolla white, the 10-toothed border 4′ wide.

D. meteloides. Cult. from New Mexico (sometimes under the name of D. WRIGHTII); like the other, but pale, almost smooth, the flower sweet-scented, and the corolla with more expanded 5-toothed border 5′–6′ wide, white or pale violet.

§ 3. *Flower and smooth 2-celled pod hanging, the former very large, 6′–10′ long: calyx splitting down lengthwise after flowering. Tropical American tree-like shrubs, cult. in conservatories: flowers sometimes double.*

D. arbòrea, has ovate or lance-oblong entire or angled pubescent leaves, long teeth to the corolla, and unconnected anthers.

D. suavèolens, has mostly entire and smooth leaves, short teeth to the corolla and the anthers sticking together.

13. CÉSTRUM. (Name given by the Greeks to some different plant, the derivation obscure.) Shrubs of warm climates, chiefly American; a few cult. in conservatories.

C. élegans, or HABROTHÁMNUS ÉLEGANS, from Mexico, has the branches and lower face of the ovate-lanceolate or oblong pointed leaves downy-pubescent, terminal corymbs, and rose-purple club-shaped corollas less than 1′ long.

C. noctúrnum, from W. Ind.; with smooth ovate leaves, and axillary clusters of yellowish green slender flowers, very sweet-scented at night.

C. Párqui, from Chili; has lanceolate smooth leaves very acute at both ends, and a terminal panicle of crowded spikes or racemes of tubular-funnel-form or partly club-shaped dull-yellow flowers, fragrant at night.

14. LÝCIUM. (Named from the country of the original species, *Lycia*.) Trailing, climbing, or low spreading shrubs, usually spiny, with small leaves often clustered on lateral spurs, and small flowers, in spring and summer.

L. vulgàre, MATRIMONY VINE. From the Mediterranean region: planted, and sparingly running wild in some places, slightly thorny, with very long and lithe recurved or almost climbing branches, oblong-spatulate leaves, slender stalked flowers clustered in the axils, and pale greenish-purple 5-cleft corolla about equalling the 5 stamens.

L. Caroliniànum. Wild in salt marshes S.: low, spiny, with fleshy thickened almost club-shaped leaves, scattered small flowers, and 4-cleft purple corolla shorter than the 4 stamens.

85. GENTIANACEÆ, GENTIAN FAMILY.

Known generally from the other monopetalous plants with free ovary by the 1-celled ovary and pod with 2 parietal placentæ covered with small seeds, along with regular flowers, their stamens as many as the lobes of the corolla and alternate with them, and the leaves opposite, simple, entire, and sessile, without stipules. The exceptions are that in some cases the ovules cover the whole inner face of the ovary, and in one group the leaves are alternate and even compound. They are nearly all very smooth and bitter-tonic plants, with colorless juice, the calyx persistent. Ours herbs, none in common cultivation.

§ 1. *Leaves opposite or whorled and entire, sessile. Corolla with the lobes mostly convolute in the bud, sometimes also plaited in the sinuses.*

+ *Style slender, deciduous from the pod: anthers soon curving.*

1. SABBATIA. Calyx 5–12-parted, the divisions slender. Corolla wheel-shaped, 5–12-parted. Style 2-parted. Pod globular, many-seeded. Slender herbs.

+ + *Style (if any) and stigmas persistent on the pod: anthers straight.*

2. FRASERA. Calyx and corolla deeply 4-parted, wheel-shaped; divisions of the latter with a glandular and fringed spot or pit on their middle. Pod oval, flattened, rather few-seeded: seeds large and flat, wing-margined. Large thick-rooted herbs, with whorled leaves and panicled flowers.

3. GENTIANA. Calyx 4–5-cleft. Corolla 4–5-lobed, often with teeth or salient folds at the sinuses, usually withering-persistent. Style short or none; stigmas 2, persistent. Pod oblong, containing innumerable small seeds with loose cellular or winged coat. Flowers solitary or clustered, mostly showy.

4. BARTONIA. Calyx 4-parted. Corolla deeply 4-cleft. Style none. Pod oblong, flattish, the minute innumerable seeds covering its whole inner face. Flowers very small. Leaves reduced to little awl-shaped scales.

§ 2. *Leaves alternate, long petioled. Corolla with the lobes valvate and the edges turned inwards in the bud. Seeds many or few, with a hard or bony coat.*

5. MENYANTHES. Calyx 5-parted. Corolla very short-funnel-form, 5-lobed, white-bearded over the whole upper face. Style slender, persistent: stigma 2-lobed. Pod globular, with many smooth and shining seeds. Flowers racemed on a stout scape; one or more long petioles sheathing its base, and bearing 3 oval or oblong leaflets.

6. LIMNANTHEMUM. Calyx and corolla 5-parted; the oval divisions of the latter with a yellowish crust at their base, and in our species otherwise naked. Style short or none. Pod several-seeded. Water-plants, bearing the flowers in an umbel on the long slender petiole of the floating round-heart-shaped leaves.

1. SABBÀTIA, AMERICAN CENTAURY. (Named for *Sabbati*, an Italian botanist.) Chiefly in sandy and low or wet grounds, along the coast (with one or two exceptions): flowers white or pink, usually handsome, in summer. ① ②

* *Flowers white, 5-parted, numerous in cymes or corymbs, seldom over ½′ broad.*

S. paniculàta. Low grounds S.: stem 1°–2° high, with 4 sharp wing-like angles; leaves linear or oblong, mostly 1-nerved; lobes of the corolla little longer than the narrow-linear calyx-lobes.

S. lanceolàta. From New Jersey S.: taller, larger-flowered, with lance-ovate 3-nerved leaves, or the upper ones lanceolate and distant, acute; lobes of corolla much exceeding the thread-shaped calyx-lobes.

S. macrophýlla. Only S.: 2°–3° high, glaucous, with terete stem, thickish lance-ovate 3–5-nerved leaves, and lobes of smaller corolla very much exceeding the bristle-like calyx-lobes.

* * *Flowers rose-pink, rarely white, with yellowish or greenish eye, 5-parted, in panicled clusters, 1′ or more broad. In rather dry ground, much branched above, 1°–3° high, the only species which extend W. to Illinois, &c.*

S. brachiàta, chiefly S., has slightly angled stem, linear or narrow-oblong leaves, and fewer flowers only 1′ broad.

S. angulàris, from N. York S. & W., has wing-like angles to the stem, ovate or heart-shaped 5-nerved leaves, and corolla 1½′ broad.

* * * *Flowers rose-purple or white, 5–6-parted, 1′ or less broad, scattered singly on long peduncles: stems slender 5′–20′ high, commonly forking, scarcely angled. All grow in salt marshes or near the coast.*

S. calycòsa. Only from Virg. S.: has oblong pale leaves narrowed at base, and lance-spatulate calyx-lobes longer than the mostly white corolla.

S. stellàris. From Mass. S.: has lance-oblong leaves or the upper linear, and linear calyx-lobes shorter than the rose-purple yellowish eyed corolla.

S. gràcilis. From Mass. S.: very slender, with linear or almost thread-like leaves, thread-shaped calyx-lobes as long as corolla, otherwise like preceding.

* * * * *Flowers bright rose-color or with white varieties, 7–12-parted, very handsome, 1½′–2′ broad: stems simple or sparingly branched, 1°–2° high.*

S. chloroides. Along sandy ponds, from Plymouth, Mass. S.: leaves lanceolate; peduncles 1-flowered, slender; calyx-lobes linear.

S. gentianoides. Wet barrens S.: stem-leaves linear, flowers short-peduncled or sessile, clustered.

2. FRÀSERA, AMERICAN COLUMBO. (Named for *John Fraser.*)

F. Carolinénsis. Rich wooded ground W. & S.: root very large and deep, bitter (used in medicine as a substitute for Columbo); stem 3° – 8° high; leaves mostly in fours, lance-oblong, or the lowest spatulate; corolla 1′ wide, greenish-yellow or whitish, and dark-dotted. ② ♃

3. GENTIÀNA, GENTIAN. (Old name, from *Gentius*, king of Illyria.) Chiefly in woods and damp ground: flowering chiefly in autumn, a few in summer.

§ 1. *Corolla without plaits at the sinuses: anthers separate: seeds wingless.* ① ②

G. quinqueflòra. Chiefly N. & W.: branching; leaves ovate-lanceolate or slightly heart-shaped at base; flowers panicled, hardly 1′ long, the 5 lobes of the pale blue corolla triangular-ovate, bristle-pointed.

G. crinita, FRINGED GENTIAN. Low grounds N. & W.: leaves lanceolate or broader, with rounded or heart-shaped base; flowers solitary on long peduncles terminating the stem or simple branches; calyx with 4 unequal lobes; corolla sky-blue, showy, 2′ long, funnel-form, the 4 wedge-obovate lobes with margins cut into a long and delicate fringe.

G. detónsa, takes the place of the preceding species N. W., and is perhaps a variety of it: has linear leaves and less fringe to the corolla (to which the name alludes), often none at the top of the lobes.

§ 2. *Corolla naked,* $1\frac{1}{2}'-2'$ *long, with plaits at the sinuses, which project more or less into teeth or thin intermediate lobes: pod stalked in the corolla.* ♃

* *Stems low, bearing* 1 – 3 *slender-peduncled flowers: seeds wingless.*

G. angustifòlia. Pine barrens from N. Jersey S.: 6′ – 15′ high, with linear leaves, and open funnel-form azure-blue corolla 2′ long, its lobes ovate; anthers separate.

* * *Stems* 1° – 2° *high, bearing clustered or rarely solitary 2-bracted flowers at the summit of the leafy stem, and often in the upper axils also.*

+ *Corolla between bell-shaped and short-funnel-form or obconical, mostly open, with ovate lobes exceeding the usually toothed appendages of the plaits.*

G. ochroleùca. Chiefly S. in dry ground: leaves obovate or spatulate-oblong, narrowed at the base; calyx-lobes linear; corolla greenish-white with greener and purplish stripes inside, somewhat bell-shaped; anthers separate; seeds wingless.

G. álba. Along the Alleghanies and N. W.: flowering at midsummer; leaves lance-ovate from a partly heart-shaped base, tapering thence to a point; calyx-lobes ovate, short; corolla yellowish-white, with short and broad lobes; anthers conniving; seeds broadly winged.

G. pubérula. Dry barrens and prairies W. & S.: low, roughish, or minutely pubescent, with lance-oblong, ovate, or linear rough-margined leaves only 1′ – 2′ long; calyx-lobes lanceolate; corolla bright blue, open, its spreading ovate lobes 2 or 3 times longer than the cut-toothed intermediate appendages; seeds not covering the walls of the pod, as they do in the related species.

G. Saponària, SOAPWORT G. Low woods, chiefly N. and along the Alleghanies; leaves lance-ovate, oblong, or obovate, or in a northern variety linear, narrowed at base; calyx-lobes linear or spatulate; corolla light blue or verging to white, little open, its short and broad lobes longer than the conspicuous 2-cleft intermediate appendages; anthers conniving or united; seeds narrowly-winged.

+ + *Corolla more club-shaped and seldom open, truncate, with no proper lobes.*

G. Andréwsii, CLOSED G. Woods especially N.: leaves lance-ovate or lance-oblong with a narrowed base; calyx-lobes ovate or oblong, short; corolla blue (rarely a white variety), its proper lobes if any shorter than the broad and more conspicuous fringe-toothed and notched appendages which terminate the folds; anthers connected; seeds broadly winged.

4. BARTÒNIA. (Named for *Prof. B. S. Barton*, of Philadelphia.) Insignificant herbs, with awl-shaped scales for leaves, and a few peduncled white flowers. ① ②

B. tenélla. Woods: 5′ – 10′ high, with branches or peduncles 1 – 3-flowered; lobes of corolla oblong, acutish; ovary 4-angled: fl. summer.

B. vérna. Bogs, only S.: smaller, less branched, 1 – few-flowered; flowers larger, in early spring; lobes of corolla spatulate, obtuse; ovary flat.

5. MENYÁNTHES, BUCKBEAN. (Name from Greek words for *month* and *flower*; application not obvious. The popular name from the leaves, somewhat resembling those of the Horsebean.)

M. trifoliàta. Cold wet bogs N.: fl. late spring; corolla white or tinged with pink; scape hardly 1° high. ♃

6. LIMNÁNTHEMUM, FLOATING-HEART. (Name formed of Greek words for *swamp* and *blossom*.) But our species grow in water, and produce through the summer the small white flowers, accompanied by spur-like thick bodies, probably of the nature of roots. ♃

L. lacunòsum, is common E. & S.: leaves 1′ – 2′ long, on very slender petioles, entire; lobes of corolla broadly oval; seeds smooth and even.

L. trachyspérma, in deeper water, from Maryland S.: leaves rounder, 2′ – 6′ broad, wavy-margined, roughish or dark-pitted beneath; petioles stouter; seeds roughened.

86. LOGANIACEÆ, LOGANIA FAMILY.

Known among monopetalous plants by having opposite leaves with stipules or a stipular line between their bases, along with a free ovary; the flower regular or nearly so, and stamens as many as the lobes of the corolla and alternate with them.

§ 1. *Woody twining climber, with evergreen leaves and showy flowers.*

1. GELSEMIUM. Calyx 5-parted. Corolla open funnel-form, the 5 lobes broad and imbricated in the bud. Stamens 5: anthers sagittate. Style slender: stigmas 2, each 2-parted, lobes linear, ovary 2-celled. Pod oval, flattened contrary to the partition, 2-valved, many-seeded. Seeds winged.

§ 2. *Herbs, not climbing.*

2. SPIGELIA. Calyx 5-parted, the lobes narrow. Corolla tubular and somewhat funnel-form, the 5 lobes valvate in the bud. Stamens 5: anthers linear. Style 1, slender, hairy above, jointed near the middle. Pod short, twin, 2-celled, few-seeded, when ripe separating across near the base which is left behind, and splitting 2 or 4 valves.

MITREOLA, of the South, comprises a couple of quite inconspicuous weeds, and POLYPREMUM, also S. is a common weedy plant; — both wholly insignificant, as well in the herbage as in the minute white flowers.

1. GELSÉMIUM, YELLOW JESSAMINE of the South, the name an Italian one for Jessamine, but of a different order from true Jessamine.

G. sempérvirens, our only species: low grounds from E. Virg. S., climbing trees, bearing shining lance-ovate small leaves (evergreen far S.), and a profusion of axillary clusters of bright yellow very fragrant handsome flowers (1′ or more long), in early spring.

2. SPIGÈLIA, PINK-ROOT or WORM-GRASS. (Named for *Adrian Spiegel*, latinized *Spigelius*.) Fl. summer.

S. Marilándica, MARYLAND P. Rich woods, from Penn. W. & S.: nearly smooth, 6′ – 18′ high; leaves sessile, lance-ovate, acute; flowers in simple or forked spike-like clusters terminating the stem or branches; corolla 1½′ long, slender, handsome, red outside, yellow within, the lobes lanceolate. Root used as a vermifuge. ♃

87. APOCYNACEÆ, DOGBANE FAMILY.

Herbaceous or woody plants, known mainly by the milky acrid juice, opposite (sometimes whorled) simple and entire leaves, without stipules, and regular monopetalous flowers with 5 in the calyx, corolla, and stamens, the lobes of the corolla convolute or twisted in the bud, the anthers conniving around the stigma or often adhering somewhat to it, ordinary pollen, filaments separate, the 2 free ovaries commonly separate, but often the styles and always the stigmas united into one. The ovaries also are often united into one, the juice in several (as of Periwinkle and Oleander) is not at all or slightly milky, and one of our genera has alternate leaves. Some are ornamental in cultivation, many are acrid-poisonous. There is commonly a ring, membrane, or other appendage on the style below the stigma, to which the anthers are apt to adhere.

§ 1. *Shrubs cult. for ornament, natives of warm climates: leaves oftener whorled.*

1. ALLAMANDA. Corolla large, yellow, with short tube abruptly expanded into cylindrical bell-shaped or funnel-form, the 5 lobes broad and rounded. Stamens at the summit of the proper tube or throat, alternate and conniving with as many 2-parted narrow scales. Ovary one and 1-celled, with 2 parietal placentæ, becoming a prickly pod. Style slender. Seeds naked.
2. NERIUM. Corolla salver-form or the long tube narrow funnel-form, the throat crowned with 5 slender-toothed scales. Stamens on the middle of the tube: anthers 2-tailed at base and tapering at the apex into a long hairy twisted awn-like appendage. Style 1. Ovaries 2, forming pods. Seeds tufted.

§ 2. *More or less woody-stemmed twiners, with opposite leaves.*

3. ECHITES. Corolla funnel-form or salver-shaped, naked in the throat. Filaments very short. Style 1. Ovaries 2, becoming 2 long terete pods. Seeds with a downy tuft. Flowers large and showy.
4. FORSTERONIA. Corolla funnel-form, nearly as in Echites, but the flower small, and filaments slender.

§ 3. *Herbs or scarcely woody plants, not twiners: bark usually abounding with tough fibres · ovaries 2, becoming many-seeded pods in fruit.*

* *Leaves opposite.*

5. VINCA. Corolla salver-shaped or the tube funnel-form, the throat narrow and naked. Stamens inserted on the upper part or middle of the tube: filaments short. Style 1, slender. Pods rather short. Seeds abrupt at each end, naked, rough. The hardy species trail or creep.
6. APOCYNUM. Corolla bell-shaped, crowned with 5 triangular appendages in the throat. Stamens attached to the very base of the corolla. Style none. A large ovate stigma unites the tips of the 2 ovaries, which in fruit form long and slender pods. Seeds with a long tuft of silky down at one end. Upright or ascending herbs, with small pale or white flowers in terminal cymes or corymbs, and very tough fibrous bark.

* * *Leaves alternate, very numerous.*

7. AMSONIA. Corolla salver-shaped or the slender tube somewhat funnel-form, bearded inside, without appendages at the throat, the lobes long and linear. Stamens inserted on and included in the tube: anthers blunt at both ends. Style 1, slender. Pods long (4′ – 6′) and slender. Seeds cylindrical, abrupt at both ends, with no tuft. Upright herbs, with terminal panicled cymes of bluish flowers.

1. ALLAMÁNDA. (Named for *Dr. F. Allamand*, who discovered the common species in Guiana.)

A. cathártica. A showy shrub of the conservatory, with bright green oblong thinnish leaves, and golden-yellow flowers $2\frac{1}{2}'$ – 3′ long.

2. NÈRIUM, OLEANDER. (The ancient Greek and Latin name.) Leaves coriaceous, rigid, closely and transversely veiny. Flowers showy, in terminal cymes, in summer, deep rose-color, or with white varieties, either single or double.

N. Oleánder, the OLEANDER of common house-culture, from the Levant: leaves lanceolate; appendage surmounting the anthers scarcely protruding; flowers large, scentless.

N. odòrum, SWEET O.: less cult., from India, more tender; leaves linear-lanceolate; appendage of the anthers protruding; flowers fragrant.

3. ECHÌTES. (Name from Greek word for *a viper*.) Plants from the warm parts of America, one not rare as a conservatory climber, viz.

E. suavèolens, or MANDEVÍLLEA SUAVEOLENS, CHILI JESSAMINE, a slender woody-stemmed tall twiner, with thin oblong or ovate heart-shaped pointed leaves, and slender peduncles bearing a few racemed very fragrant flowers, the white corolla with ample 5-lobed border, 2′ broad.

4. FORSTERÒNIA. (Named for an English botanist, *T. F. Forster*.)

F. diffórmis, in low grounds from Virginia S. & W., is a barely woody twiner, the flowering branches herbaceous and downy; leaves thin, oval-lanceolate, pointed, or sometimes linear, narrowed into a petiole; flowers ¼′ long, in cymes, greenish-yellow, all summer.

5. VÍNCA, PERIWINKLE. (Latin name, from a word meaning *to bind*, from the thread-like stems.) ♃

§ 1. TRUE PERIWINKLES, *cult. from Europe, hardy or nearly so, smooth, trailing over the ground or creeping, only the short flowering stems ascending, with blue (or by variation white) flowers solitary in the axils, in spring or early summer.*

V. mìnor, COMMON PERIWINKLE, in all country-gardens, spreading freely by the creeping sterile stems, evergreen, with ovate or oblong-ovate shining leaves barely 1½′ long, and almost truncate wedge-shaped lobes to the corolla: fl. early spring.

V. màjor, LARGE P., not quite hardy N., a variety with variegated leaves is most cultivated, larger than the first species and leaves rounder, the lobes of corolla obovate.

V. herbàcea: not evergreen; stems reclining and rooting; leaves lance-oblong, lobes of the more purple-blue corolla oblong-obovate: fl. late spring.

§ 2. *Tropical erect, somewhat woody at base: flowers produced all the season.*

V. ròsea, house and bedding plant from West Indies, with oblong-petioled veiny leaves, and showy corolla with slender tube and very narrow orifice, rose-purple, or white, with or without a pink eye.

6. APÓCYNUM, DOGBANE (to which the name in Greek refers), INDIAN HEMP, from the use made of the bark. Fl. summer. ♃

A. androsæmifòlium, SPREADING D. Along thickets, mostly N.: branches forking and widely spreading; leaves ovate, petioled; corolla open bell-shaped with spreading lobes.

A. cannábinum, COMMON INDIAN HEMP. Gravelly or wet banks of streams: branches more erect; leaves oblong, lance-oblong, ovate, or slightly heart-shaped; flowers more crowded and erect; lobes of the corolla little spreading.

7. AMSÒNIA. (Named for a *Mr. Charles Amson*.) Low grounds chiefly S.; very leafy, 2° – 3° high, smooth or somewhat hairy, with rather small flowers, in late spring.

A. Tabernæmontàna. Leaves varying from ovate or lance-ovate to lanceolate, acute at each end, pale beneath.

A. ciliàta. Leaves linear or linear-lanceolate, the margins and mostly the stems beset with some scattered bristles.

88. ASCLEPIADACEÆ, MILKWEED FAMILY.

Plants with milky juice, leaves, pistils, fruits, and seeds nearly as in the preceding family; but the anthers more connected with the stigma, their pollen collected into firm waxy or granular masses (mostly 10), the short filaments (monadelphous except in the last genus) commonly bear curious appendages behind the anthers forming what is called a crown, and the corolla more commonly valvate in the bud. The flowers are rather too difficult for the beginner readily to understand throughout. For a particular study of them the Manual must be used.

§ 1. *Erect herbs, with ordinary foliage, and deeply 5-parted reflexed calyx and corolla. Flowers in simple umbels. Fruit a pair of pods (follicles,) containing numerous flat seeds furnished with a coma* (Lessons, p. 135, fig. 317) *or long tuft of soft down at one end.*

1. ASCLEPIAS. Stamens with their short filaments monadelphous in a ring or tube, bearing behind each anther a curious erect and hood-like or ear-like appendage, with a horn projecting out of the inside of it: the 5 broad anthers closely surrounding and partly adhering to the very thick stigma, a membranous appendage at their tip inflected over it. Each of the 2 cells of the anther has a firm waxy pear-shaped pollen-mass in it: and the two adjacent masses from two contiguous anthers are suspended by a stalk from a dark gland; these 5 glands, borne on the margin of the flat top of the stigma, stick to the legs, &c. of insects, and are carried off, each gland taking with it 2 pollen masses, the whole somewhat resembling a pair of saddle-bags.
2. ACERATES. Like Asclepias, but no horn in the hoods or ear-like appendages, and the flowers always greenish.

§ 2. *Twining plants with ordinary foliage; pods and seeds nearly as in Asclepias.*

* *Anthers with their hanging pollen-masses nearly as Asclepias: pods smooth and even.*

3. ENSLENIA. Calyx and corolla 5-parted, the divisions lance-ovate and nearly erect. The 5 appendages of the filaments are in the form of membranaceous leaflets, each bearing a pair of awns on their truncate tip. Herb.
4. VINCETOXICUM. Corolla 5-parted, wheel-shaped. A flat and fleshy 5–10-lobed disk or crown in place of the hoods of Asclepias. Herbs.

* * *The 10 pollen-masses horizontal, fixed in pairs to 5 glands of the stigma.*

5. GONOLOBUS. Corolla wheel-shaped: a fleshy and wary-lobed ring or crown in its throat.

* * * *The 10 short pollen-masses fixed by their base in pairs to the 5 glands of the stigma, and erect. Shrubby plants, of tropical regions.*

6. HOYA. Corolla wheel-shaped, 5-lobed, thick and wax-like in appearance. Crown of 5 thick and depressed fleshy appendages radiating from the central column.
7. STEPHANOTIS. Corolla salver-shaped, the tube including the stamens, crown, &c., in its somewhat swollen base, the 5 ovate lobes convolute in the bud. Crown of 5 thin erect appendages. Stigma conical.

* * * * *Anthers distinct, the 5 pollen-masses each composed of 4 small granular masses united, and applied directly to the glands of the stigma without any stalk. Shrubby twiners.*

8. PERIPLOCA. Corolla 5-parted, wheel-shaped, the divisions hairy on the upper face: alternate with them are 5 small thick scales, each bearing a bristle-shaped appendage. Filaments distinct, bearing anthers of more ordinary appearance than in the rest of this family. Stigma hemispherical. Pods smooth.

§ 3. *Fleshy low plants, Cactus-like, with only small fleshy scales or teeth in place of leaves, on the angles of the thickened stems or branches.*

9. STAPELIA. Flowers large, lurid, solitary lateral. Calyx 5-parted. Corolla 5-cleft, wheel-shaped: within is a crown formed of two rings of short appendages or lobes. Masses of waxy pollen 10, erect.

1. **ASCLÈPIAS**, MILKWEED, SILKWEED. (The Greek name of *Æsculapius*, father of medicine.) Flowering in summer. ♃

* *Flowers bright orange or red: pods smooth: leaves opposite, except in the first.*

A. tuberòsa, BUTTERFLY-WEED, PLEURISY ROOT. Dry hills: milky juice hardly any; stems and mostly scattered linear or lance-oblong leaves hairy; flowers bright orange.

A. Curassàvica. Wild far S., cult. from S. America, as a house and bedding plant; nearly smooth; leaves lanceolate; umbels long-peduncled; corolla scarlet-red, the hoods orange.

A. paupércula. Wet barrens from N Jersey S.: tall, smooth, with long lance-linear leaves, one or more few-flowered umbels raised on long peduncle, and red corolla with bright orange hoods.

A. rùbra. Low barrens from N. Jersey S.: smooth, with lance-ovate gradually taper-pointed leaves, a few many-flowered umbels on a long naked peduncle, and purple-red flowers.

* * *Flowers pink or light rose-purple: leaves all opposite: pods smooth.*

A. incarnàta, SWAMP MILKWEED. Wet grounds, with very leafy branching stems, lanceolate or lance-oblong acute leaves, often slightly heart-shaped at the base; smooth or smoothish, or in var. PÚLCHRA pubescent and the leaves very short-petioled.

* * * *Flowers dull purplish, greenish, or white.*

+ *Stems branching, almost woody at base: leaves all opposite: pods smooth.*

A. perénnis. Low grounds S.: nearly smooth; leaves lanceolate or lance-ovate, slender-petioled; flowers small, white; seeds mostly without a tuft!

+ + *Stem simple: leaves all opposite and closely sessile or clasping by a heart-shaped base, the apex rounded or notched: plants smooth, pale or glaucous.*

A. obtusifòlia. Sandy grounds, 2° - 3° high, the rather remote broadly oblong leaves wavy; umbel mostly solitary, long-peduncled; flowers pretty large, greenish-purplish.

A. amplexicaùlis. Dry barrens S.: stems reclining, 1° - 2° high, very leafy; leaves ovate-heart-shaped; umbels several, short-peduncled; corolla ash-colored, the hoods white.

+ + + *Stem simple or nearly so, leafy to the top: leaves all opposite, ovate, oval, or oblong, pretty large, short-petioled: umbels lateral and terminal: flowers ½' long or nearly so.*

++ *Pods beset with soft prickle-shaped or warty projections.*

A. Cornùti, COMMON MILKWEED of fields and low grounds N.: downy, or the large pale leaves soon smooth above; flowers dull greenish-purplish.

++ ++ *Pods even, but usually minutely downy.*

A. phytolaccoìdes, POKE-MILKWEED. Moist grounds N. & W.: smooth or smoothish, 3° - 5° high; leaves large, pointed or acute at both ends; umbels loose, the long pedicels (1' - 3') equalling the peduncle; corolla greenish, but the more conspicuous hoods white.

A. purpuráscens. Rich ground N. & W.: 1° - 3° high; leaves downy beneath, smooth above, the upper taper-pointed; pedicels of the rather loose umbel shorter than the peduncle; corolla dark dull purple.

A. variegàta. Dry grounds, commoner S. & W.: 1° - 2° high, nearly smooth; leaves oval or obovate, slightly wavy; peduncle and crowded pedicels short and downy; corolla white, the hoods purplish.

+ + + + *Stems simple or rarely branched, slender: leaves most of them in whorls: pods slender and smooth: flowers small, white or whitish.*

A. quadrifòlia, FOUR-LEAVED M. Rocky woods mostly N.: stems 1° - 2° high, nearly smooth, naked below, bearing about the middle one or two whorls of 4 ovate or lance-ovate taper-pointed petioled leaves, and beneath or above them usually a pair of smaller ones; pedicels slender; corolla mostly tinged with pink, the hoods white.

A. verticillàta, Whorled M. Dry ground, 1° – 2° high, smoothish; stems very leafy throughout: leaves very narrow linear or thread-shaped, in whorls of 3 – 6; flowers greenish-white.

2. ACERÀTES, GREEN MILKWEED. (Name from the Greek, means *without a horn*, i. e. none to the hood-like appendages, in which it differs from Asclepias.) Flowers green or greenish, in summer. ♃

§ 1. *Flowers in compact lateral umbels: corolla with oblong reflexed divisions: the hoods erect: pods slender, sometimes downy, but with the surface even.*

A. viridiflòra. Dry sandy or gravelly soil: soft-downy or smoothish, 1° – 2° high; leaves varying from oval to linear, mostly opposite; globular umbels nearly sessile; flowers short-pedicelled, nearly ½′ long when open; hoods not elevated above the base of the corolla.

A. longifòlia. Low barrens W. & S.: rather hairy or roughish, 1° – 3° high, with very numerous mostly alternate linear leaves, flowers smaller and on slender pedicels, the umbel peduncled, hoods elevated on a short ring of filaments above the base of the corolla.

§ 2. *Flowers in loose terminal and solitary or corymbed umbels: divisions of the corolla barely spreading, but the large hoods spreading and slipper-shaped: pods thick, often with some soft tubercle-like projections.*

A. paniculàta. Dry prairies and barrens from Ill. S. & W.: smoothish, 1° high; leaves alternate, oblong or lance-oblong; flowers 1′ broad, green, the hoods purplish.

3. ENSLÉNIA. (Named for *A. Enslen*, an Austrian traveller.) ♃

E. álbida. River-banks from Ohio S. & W.: climbing, 8° – 12°; smooth, with opposite heart-ovate long-petioled leaves, and small whitish flowers in raceme-like clusters on axillary peduncles, all late summer.

4. VINCETÓXICUM. (Name is equivalent to *Poison Periwinkle.*) ♃

V. nigrum, from Eu.: a low-twining smooth weed, escaping from gardens E.; leaves ovate and lance-ovate; flowers small, brown-purple, rather few in axillary umbels, in summer.

5. GONÓLOBUS. (Name in Greek means *angled pod.*) Ours are twining herbs, along river-banks, chiefly S., with opposite heart-shaped petioled leaves, and corymbs or umbels of dark or dull-colored small flowers on peduncles between the petioles, in summer. ♃

G. lævis. From Virg. to Illinois S.: smooth or only sparingly hairy, the yellowish-green flowers and the longitudinally ribbed pods smooth.

G. obliquus. From Penn. S.: hairy, somewhat clammy; flowers minutely downy outside, long and narrow in the bud, dull crimson-purple within, the strap-shaped or lanceolate divisions ½′ long; pods ribless, warty.

G. hirsùtus. From Virginia S.: differs from the last in its short-ovate flower-buds, the oval or oblong divisions of corolla only about ¼′ long.

6. HÓYA, WAX-PLANT. (Named for *T. Hoy*, an English florist.)

H. carnòsa, a well-known house-plant from India; with rooting stems, thick and fleshy oval leaves, umbels of numerous flesh-colored or almost white flowers, the upper surface of corolla clothed with minute papillæ.

7. STEPHANÒTIS. (Name from Greek for *crown* and *ear*, referring to the appendages of the stamens.)

S. floribúnda, from Madagascar: a fine hot-house twiner, very smooth, with opposite oval or oblong thickish leaves, and lateral umbels of very showy fragrant flowers, the pure white corolla 1½′ in diameter, the tube 1′ long.

8. PERIPLOCA. (Name, a Greek word, implies that the plant twines.)

P. Græca, of S. Eu., cult. as an ornamental twiner, hardy through the Middle States: smooth, with opposite ovate mostly pointed leaves, on short petioles, and lateral cymes of rather small flowers, the corolla greenish-yellow with the upper face of the oblong lobes brownish-purple: in summer.

9. STAPÈLIA. (Named for a Dutch naturalist, *Dr. Van Stapel.*) Strange-looking fleshy plants of the Cape of Good Hope, cult. in conservatories along with Cactuses. The commonest is

S. hirsùta. Stems or branches 6′ – 10′ high, with concave sides, pale and obscurely downy; flower 3′ – 4′ in diameter, dull purple and yellowish with darker transverse stripes, beset with purple very long hairs, and with denser hairiness towards the centre, exhaling a most disgusting odor, not unlike that of putrid meat.

89. OLEACEÆ, OLIVE FAMILY.

Trees or shrubs, chiefly smooth, without milky juice, distinguished among monopetalous plants with free ovary by the regular flowers having stamens almost always 2, and always fewer than the 4 (sometimes 5 or more) divisions of the corolla, the ovary 2-celled and (except in Jasminum and Forsythia) with one pair of ovules in each cell: style if any only one, rarely 2-cleft. A few are nearly or quite polypetalous; others apetalous.

§ 1. *Calyx and corolla with 5 - 8 lobes. A single erect ovule and seed in each cell.*

1. JASMINUM. Corolla salver-shaped, the lobes convolute in the bud. Stamens 2, included in the tube. Ovary and the berry-like fruit 2-lobed, 2-seeded.

§ 2. *Calyx and corolla with the parts in fours, or sometimes* (in Fraxinus) *one or both wanting. Ovules hanging, usually a pair in each cell, many in No. 2. Leaves opposite, except accidentally.*

* *Leaves simple: flowers perfect and complete.*

+ *Ovules and seeds numerous or several in each cell of the ovary and pod.*

2. FORSYTHIA. Corolla golden yellow, bell-shaped, 4-lobed, the lobes convolute in the bud. The 2 stamens and style short. Pod ovate. Leaves deciduous.

+ + *Ovules a pair in each cell, but the seeds often fewer.*

3. SYRINGA. Corolla salver-form, the lobes valvate in the bud, the tube much longer than the 4-toothed calyx. Fruit a pod, 4-seeded, flattened contrary to the narrow partition, 2-valved, the valves almost conduplicate. Seeds slightly wing-margined. Leaves deciduous.
4. LIGUSTRUM. Corolla short funnel-form, with spreading ovate obtuse lobes, valvate in the bud, white. Fruit a 1 – 4-seeded black berry. Leaves firm and thickish, but deciduous.
5. OLEA. Corolla short, bell-shaped, or deeply cleft into 4 spreading lobes, white. Fruit a drupe, the hard stone often becoming 1-celled and 1-seeded. Leaves evergreen.
6. CHIONANTHUS. Corolla white, 4-parted, or of 4 very long and narrow linear petals slightly or scarcely united at their base; to which the 2 (rarely 3 or even 4 in cultivation) very short stamens barely adhere. Fruit a fleshy and globular drupe, the stone becoming 1-celled and commonly 1-seeded. Leaves deciduous.

* * *Leaves pinnate: flowers polygamous or diœcious, in most species apetalous.*

7. FRAXINUS. Calyx small, sometimes obsolete or wholly wanting. Petals 4, 2, or none. Anthers large. Fruit a simple samara or key (Lessons, p. 131, fig. 300), usually becoming 1-celled and 1-seeded. Leaves deciduous.

1. JÁSMINUM, JESSAMINE. (From the Arabic name.) Cultivated for ornament, from the Old World, all tender and house-plants except at the South. Flowers fragrant.

* *Flowers yellow: leaves commonly alternate and compound.*

J. odoratíssimum, COMMON SWEET YELLOW J., from Madeira: smooth, twining; leaflets 3 or 5, ovate; peduncles terminal, few-flowered.

J. revolùtum, from Himalayas or China: not twining, has mostly 3–7 leaflets, and more numerous and fragrant flowers, $1\frac{1}{2}'$ wide.

* * *Flowers white: leaves opposite.*

J. officinàle, COMMON WHITE J., from the East, has striate-angled branches scarcely twining, about 7 oblong or lance-ovate leaflets, a terminal cyme of very fragrant flowers and calyx-teeth slender.

J. grandiflorum, from India, has 7 or 9 oval leaflets, the uppermost confluent, larger and fewer flowers than the foregoing, reddish outside.

J. Azóricum, from the Azores and Madeira: not twining, with 3 ovate or heart-shaped leaflets, terminal cymes of very sweet-scented flowers, and very short calyx-teeth.

J. Sámbac, from Tropical India: scarcely climbing, pubescent; leaves simple, ovate, or heart-shaped; flowers in small close clusters; calyx-teeth about 8, slender, the rounded lobes of the corolla as many; flowers simple or double, very fragrant, especially at evening.

2. FORSÝTHIA. (Named for *W. A. Forsyth*, an English botanist.) Ornamental shrubs, from China and Japan, with flowers from separate lateral buds, preceding the serrate leaves, in early spring.

F. viridíssima, a vigorous shrub, with strong and mostly erect yellowish-green branches, covered in early spring with abundant showy yellow flowers, followed by the deep green lance-oblong leaves.

F. suspénsa, shrub with long and slender weak branches hanging, or some of them creeping, to be treated as a climber; flowers still earlier, but less profuse; leaves thinner, duller, ovate.

3. SYRÍNGA, LILAC. (From Greek word for *tube*, alluding either to the tubular corolla or to the twigs, used for pipe-stems.) Familiar ornamental tall shrubs, from the Old World, with scaly buds in the axils of the leaves, but hardly ever a terminal one (so that there is only a pair at the tip of a branch), entire leaves on slender petioles, and crowded compound panicles or thyrsus of mostly fragrant flowers, in spring.

S. vulgàris, COMMON L., from E. Europe or Persia: with ovate and more or less heart-shaped leaves, and lobes of corolla moderately spreading; fl. lilac or pale violet, and a white variety.

S. Pérsica, PERSIAN L.; more slender, with lance-ovate leaves, and looser clusters of lilac-purple or paler or sometimes white flowers, border of the corolla flat when open.

4. LIGÚSTRUM, PRIVET or PRIM. (Classical Latin name.) Shrubs of Old World, planted for ornament, with short-petioled entire leaves and panicles of small flowers, in early summer.

L. vulgàre, COMMON P., of Europe, here planted for hedges, and running wild E.; leaves small, lance-ovate or lance-oblong.

L. Japónicum. Cult. from Japan, not hardy N.: has long and widely spreading branches, larger ovate leaves, and larger flowers in ample panicles.

5. ÒLEA, OLIVE. (The classical Latin name.) Flowers small, and in small panicles or corymbs, in spring.

O. Europæa, OLIVE of the Levant, sometimes planted far S.: tree with lanceolate or lance-oblong pale entire leaves, whitish-scurfy beneath, and oblong edible oily fruit.

O. Americàna, DEVIL-WOOD. Wild along the coast from Virginia S.: small tree, with lance-oblong and entire very smooth green leaves (3′–6′ long), and spherical fruit.

O. fràgrans, or OSMÁNTHUS FRAGRANS, of Japan and China (differing from Olive genus in the almost 4-parted corolla and 2-parted style), cult. in green-houses for the exquisite fragrance of its very small flowers; the leaves oblong or oval, sharply serrate, bright green, very smooth.

6. CHIONÁNTHUS, FRINGE-TREE. (Name of the Greek words for *snow* and *blossom*, from the very light and loose panicles of drooping snow-white flowers.)

C. Virgínica, COMMON F. River-banks from Penn. S., and planted for ornament: shrub or low tree, with entire oval or obovate leaves (3′–5′ long), the lower surface often rather downy, loose panicles of flowers in late spring or early summer, petals 1′ long, and fruit blue-purple with a bloom.

7. FRÁXINUS, ASH. (Classical Latin name.) Timber-trees, with light and tough wood, dark-colored buds, and small insignificant flowers appearing in spring with or rather before the leaves of the season, from separate buds in the axils of the leaves of the preceding year.

§ 1. EUROPEAN ASHES, *planted as shade trees, &c.: flowers polygamous.*

F. Órnus, FLOWERING ASH, of S. Europe, the tree which furnishes *manna*, not hardy N., sometimes planted S.: this and a species like it in California have 4 petals, either distinct or slightly united, or sometimes only 2, narrow, greenish; leaflets 5–9, lanceolate or oblong, small.

F. excélsior, ENGLISH or EUROPEAN ASH. Hardy fine tree, with bright green lance-oblong leaflets nearly sessile and serrate; petals none and calyx hardly any; fruit flat, linear-oblong. The WEEPING ASH is a variety or sport of this.

§ 2. AMERICAN ASHES, *all destitute of petals, and diœcious or mostly so.*

* *Fruit terete at the base, winged from the other end: calyx minute, persistent: leaflets 7–9, or sometimes 5, stalked, either sparingly toothed or entire.*

F. Americàna, WHITE ASH. Large forest tree of low grounds, furnishing valuable timber; with ash-gray branches, smooth stalks, ovate or lance-oblong pointed leaflets either pale or downy beneath; and rather short fruit with a terete marginless body and a lanceolate or wedge-linear wing.

F. pubéscens, RED ASH. Common E. & S.; known by its velvety-pubescent young shoots and leafstalks, and fruit with its flattish 2-edged seed-bearing body acute at the base, the edges gradually dilated into the lance-linear or oblanceolate wing.

F. víridis, GREEN ASH. Like the last, into which it seems to pass, but is smooth, with leaves bright green on both sides: a smaller tree, most common W. & S.

* * *Fruit flat and winged all round: leaflets mostly green both sides and serrate.*

F. sambucifòlia, BLACK ASH. Small tree in swamps, N. & N. W., with tough wood separable in layers, used for hoops and coarse baskets; the bruised leaves with the scent of Elder; smooth; leaflets 7–11, sessile on the main stalk, oblong-lanceolate tapering to a point; calyx none, at least in the fertile flowers; fruits linear-oblong.

F. quadrangulàta, BLUE ASH. Large forest tree W., yielding valuable wood; with square branchlets, 5–9 ovate veiny leaflets on short stalks, and narrowly oblong fruits.

F. platycárpa, CAROLINA WATER-ASH. River swamps S.: small tree, with terete branchlets, 5–7 ovate or oblong short-stalked leaflets acute at both ends, and broadly winged (sometimes 3-winged) fruits, oblong with a tapering base.

III. APETALOUS DIVISION. Includes the orders with flowers destitute of corolla; some are destitute of calyx also.

90. ARISTOLOCHICAEÆ, BIRTHWORT FAMILY.

Known from all other apetalous orders by the numerous ovules and seeds in a 6-celled ovary, to which the lower part of the calyx is adherent, the latter mostly 3-lobed, the stamens generally 6 or 12. Anthers adnate and turned outwards. Calyx dull-colored, valvate in the bud. Leaves petioled, usually heart-shaped, not serrate. Flowers solitary, perfect, commonly large. Bitter, tonic or stimulant, sometimes aromatic plants.

1. ASARUM. Low stemless herbs, with one or two leaves on long petioles, and a flower at the end of a creeping aromatic rootstock, the flowers therefore close to the ground. Calyx regular, with 3 equal lobes. Stamens 12, distinct, borne on the apex of the ovary or the base of the stout style, usually pointed beyond the anther. Seeds large, thickish, in a rather fleshy and irregularly bursting pod.
2. ARISTOLOCHIA. Leafy-stemmed herbs or woody twiners. Calyx tubular variously irregular, often curved. Filaments none: anthers adherent directly and by their whole inner face to the outside of the 3-6-lobed stigma. Seeds very flat, in a dry 6-valved pod.

1. ÁSARUM, ASARABACCA, WILD GINGER. (Ancient name, of obscure derivation.) On hillsides in rich woods: fl. spring. ♃

§ 1. *Filaments slender, much longer than the short anthers: style* 1, *thick, bearing* 6 *thick stigmas: leaves a single pair with a peduncle between them.*

A. Canadénse, CANADA WILD GINGER, sometimes called SNAKEROOT. Common N.: soft-pubescent; leaves broadly heart-shaped or kidney-shaped, not evergreen; calyx bell-shaped but cleft down to the adherent ovary, brown-purple inside, the abruptly spreading lobes pointed.

§ 2. *Filaments short or almost none: anthers oblong-linear: styles* 6, *each* 2-*cleft, bearing the stigma below the cleft: leaves thick and evergreen, smooth, often mottled, usually only one each year: rootstocks in a close cluster.*

A. Virgínicum, VIRGINIA W. Along the Alleghanies S.: leaves small, rounded heart-shaped; calyx tubular-bell-shaped with a somewhat narrowed throat and broad short lobes, the base coherent only with base of the ovary.

A. arifòlium, from Virginia S, has larger somewhat halberd-shaped leaves, and very short and blunt lobes to the calyx.

2. ARISTOLÒCHIA, BIRTHWORT. (Ancient name, from medicinal properties.) Cells of the anthers in our species 4 in a horizontal row under each of the 3 lobes of the stigma, i. e. two contiguous 2-celled anthers in each set, or 6 in all. Flowers in and above the axils.

A. Serpentària, VIRGINIA SNAKEROOT (used in medicine). Rich woods, chiefly in Middle States and S.: low downy herb; stems clustered about 1° high; leaves ovate or oblong and heart-shaped, sometimes halberd-form, acute; flowers all next the root, curved like the letter S, contracted in the middle and at the throat, in summer. ♃

A. Sipho, PIPE-VINE, DUTCHMAN'S PIPE (from the shape of the curved calyx). Rich woods from Penn. along the mountains S. and planted for arbors: very tall-climbing woody twiner, smooth, but the rounded heart-shaped leaves often downy beneath, these becoming 8′-12′ broad; peduncles with a clasping bract, drooping; calyx 1½′ long, inflated above the ovary, narrowing above, contracted at the throat, the flat border brown-purple and obscurely 3-lobed: fl. late spring.

A. tomentòsa. Common S.: a more slender woody climber, with smaller rounder and very veiny downy leaves, and yellowish flower with an oblique almost closed brownish orifice, the border reflexed: fl. late spring or summer.

91. NYCTAGINACEÆ, FOUR-O'CLOCK FAMILY.

Represented by a few plants with tubular or funnel-form calyx colored like a corolla, and falling away from a persistent lower portion which closes completely over the 1-celled 1-ovuled ovary and seed-like fruit, forming a hard and dry covering which would be mistaken for a true pericarp. Stamens 2 – 5, the long slender filaments hypogynous, but apt to adhere somewhat to the sides of the calyx-tube above. Embryo coiled around some mealy albumen. (Lessons, p. 15, fig. 36, 37.) Ours are herbs, with opposite simple entire or wavy leaves, and jointed stems, tun'd at the joints.

1. ABRONIA. Flowers small, many in a peduncled umbel-like head surrounded by an involucre of about 5 separate bracts. Calyx salver-shaped with a slender tube, and a corolla-like 5-lobed border, which is plaited in the bud, the lobes generally notched at the end. Stamens 5 and style included.
2. OXYBAPHUS. Flowers small, a few together surrounded by a 5-lobed involucre, which enlarges and becomes thin, membranaceous, reticulated, and wheel-shaped after flowering. Calyx with a very short tube constricted above the ovary, expanding into a bell-shaped 5-lobed corolla-like border, open only for a day. Stamens (mostly 3) and slender style protruding. Fruit (persistent base of calyx) akene-like, strongly-ribbed.
3. MIRABILIS. Flower large, in the common species only a single one in the cup-shaped 5-cleft green involucre, which thus exactly imitates a calyx, as the tubular funnel-shaped or almost salver-shaped delicate calyx does a corolla. Stamens 5, and especially the style (tipped with a shield-shaped stigma) protruded. Fruit ovoid, smooth and nearly even.

1. ABRÒNIA. (Name from Greek word meaning *delicate.*) Western North American herbs, cultivated for ornament: fl all summer. ♃

A. umbellàta, from coast of California, has prostrate slender stems, ovate-oblong slender petioled leaves, and rose-purple flowers open by day, the involucre of small bracts.

A. fràgrans, from Rocky Mountains, hardy N., has ascending branching stems, lance-ovate leaves, and white sweet-scented flowers opening at sunset; the involucre of conspicuous ovate scarious and whitish bracts.

2. OXÝBAPHUS. (Name from a Greek word for a *vinegar-saucer,* from the shape of the involucre.) ♃ Several species on Western plains: fl. rose-purple, all summer.

O. nyctagíneus. Rocky or gravelly soil from Wisconsin W. & S.: smooth or smoothish; leaves petioled, varying from ovate to lanceolate, obtuse or heart-shaped at base.

O. álbidus. From North Carolina S.: often hairy above; leaves sessile or nearly so, acute at base, lanceolate or oblong; fruit more hairy.

3. MIRÁBILIS, FOUR-O'CLOCK or MARVEL-OF-PERU. (Clusius called it *Admirabilis,* which Linnæus shortened.) Natives of warm parts of America: roots very large and fleshy; leaves more or less heart-shaped, the lower petioled; flowers mostly clustered, showy, opening towards sunset or in cloudy weather, produced all summer. ♃

M. Jalàpa. Cult. for ornament in many varieties as to flower (red, yellow, white, or variegated), its tube only 2′ long and thickish, stamens shorter than its spreading border; whole plant nearly smooth.

M. longiflòra. Less common in cult.; tube of the sweet-scented flower 6′ long and clammy-hairy (as well as the upper leaves); stamens shorter than its spreading white border.

M. Wrightiàna. Texas and cult.: more slender than the last, nearly smooth, tube of the smaller and more slender faintly fragrant flower 4′ long, the border white tinged with rose; stamens and style much protruding.

92. PHYTOLACCACEÆ, POKEWEED FAMILY.

A small family, represented here only by a single species of the principal genus,

1. **PHYTOLÁCCA**, POKE or POKEWEED. (A mongrel name, of the Greek word for *plant* prefixed to the French *lac*, lake, alluding to the crimson coloring-matter of the berries.) Calyx of 5 rounded petal-like white sepals. Stamens 5 – 30. Ovary of several cells and lobes, bearing as many short styles, in fruit a depressed juicy berry, containing a ring of vertical seeds; these formed on the plan of those of the next family. ♃

P. decándra, COMMON P. or SCOKE, GARGET, &c. Coarse smooth weed of low grounds, with large acrid-poisonous root, stout stems 6° – 9° high, alternate ovate-oblong leaves on long petioles, and racemes becoming lateral opposite a leaf, in summer, ripening the dark crimson purple berries in autumn; stamens, styles, and seeds 10.

93. CHENOPODIACEÆ, GOOSEFOOT FAMILY.

Represented chiefly by homely herbs, with inconspicuous greenish flowers; the 1-celled ovary has a single ovule and ripens into an akene or utricle, containing a single seed, usually with embryo coiled more or less around mealy albumen. Leaves chiefly alternate. Plants neither attractive nor easy to students; only the cultivated plants and commonest weeds here given.

§ 1. *Cultivated for ornament, twining plant, with white flowers: calyx corolla-like.*

1. BOUSSINGAULTIA. Flowers in slender spikes from the axils of the leaves, perfect. Calyx 6-parted, spreading, and with one or two exterior sepals or bracts. Stamens 6, with slender filaments. Style slender: stigmas 3, club-shaped. Fruit a thin akene, pointed with the persistent style.

§ 2. *Cultivated for food, from Eu.: flowers greenish, as is usual in the family.*

2. BETA. Flowers perfect, clustered, with 3 bracts and a 5-cleft calyx becoming indurated in fruit, enclosing the hard akene, the bases of the two coherent. Stamens 5. Style short: stigmas mostly 2. Seed horizontal.
3. SPINACIA. Flowers diœcious, in axillary close clusters; the staminate ones racemed or spiked, consisting of a 4 – 5-lobed calyx and as many stamens. Pistillate flowers with a tubular calyx which is 2 – 3-toothed at the apex and 2 – 3-horned on the sides, hardening and enclosing the akene. Styles 4. Seed vertical.

§ 3. *Weeds of cultivation, or of roadsides, fields, &c. Flowers perfect, bractless.*

4. BLITUM. Flowers in close axillary clusters or heads, which are sometimes confluent into interrupted spikes. Calyx 2 – 5-parted, becoming fleshy or berry-like in fruit in the genuine species. Stamens 1 – 5. Styles or stigmas 2. Seed vertical in the calyx.
5. CHENOPODIUM. Flowers in small clusters collected in spiked or sometimes open panicles. Calyx mostly 5-cleft, not succulent in fruit. Ovary and utricle depressed. (Lessons, p. 130, fig. 297.) Styles 2, rarely 3. Seed horizontal, or in a few species occasionally vertical.

The following also are common species along the coast or near salt-water: —

Átriplex pátula, and one or two other species of ORACHE: most like Spinacia, but scurfy or mealy.

Salicórnia herbácea, and two other species of GLASSWORT: low, leafless, fleshy, jointed, branching plants, with the flowers sunken in the fleshy spikes.

Suæda marítima, SEA BLITE: with branching stems, and small flowers in the axils of linear nearly terete fleshy leaves.

Sálsola Kàli, SALTWORT: bushy-branching annual, with awl-shaped

prickly pointed leaves, and flesh-colored horizontal wings on the back of the fruiting calyx, making a circular broad border.

1. **BOUSSINGAÚLTIA.** (Named for the traveller and agricultural chemist, *Boussingault.*)

B. baselloides, of South America: high twining plant, in cultivation herbaceous, from oblong tubers resembling small potatoes: smooth, with somewhat heart-shaped succulent leaves, and slender racemes of deliciously fragrant small flowers in autumn. ♃

2. **BÈTA,** BEET. (Latin name.) One species in cultivation, viz.: —

B. vulgàris, COMMON BEET, from S. Eu.: cult in many varieties, with ovate-oblong smooth often wavy-margined leaves, sometimes purple-tinged; flower-clusters spiked; root conical or spindle-shaped. MANGEL WURTZEL or SCARCITY-ROOT is a mere variety, the root used for feeding cattle. ②

3. **SPINÀCIA,** SPINACH. (Name from Latin for *spine* or *thorn*; probably from the horns or projections on the fruiting-calyx which become rather spiny in one variety.)

S. oleràcea, COMMON SPINACH, cult. from the Orient, as a pot-herb; the soft-fleshy leaves triangular or ovate and petioled. ① ②

4. **BLÌTUM,** BLITE. (Ancient Greek and Latin name of some pot-herb or of the Amaranth.) Fl. summer.

B. capitàtum, STRAWBERRY BLITE, the flower-heads as the fruit matures becoming bright red and juicy, like strawberries; leaves triangular and halberd-shaped, wavy-toothed, smooth and bright green. Dry banks, margins of woods, &c. N., sometimes in gardens. ② ①

B. Bonus-Henricus, GOOD-KING-HENRY, cult. in some old gardens, is between a Blite and a Goosefoot, being slightly mealy, as in the latter, and the calyx not fleshy nor fully enclosing the fruit, but the seed is vertical; leaves triangular and partly halberd-shaped; flower-clusters crowded in an interrupted terminal spike. ♃

5. **CHENOPÒDIUM,** GOOSEFOOT (which the name denotes in Greek), PIGWEED, &c. Weeds: fl. late summer and autumn.

§ 1. *Either smooth or with scurfy mealiness, insipid, never hairy nor aromatic.* ①

C. álbum, WHITE G. or LAMB'S-QUARTERS; the commonest species in all cult. ground: pale, more or less mealy, with leaves varying from rhombic-ovate to lanceolate, either angled-toothed or entire, and flower-clusters in dense panicled spikes. Var. BOSCIÀNUM, wild in shady places, mostly S., has loose branches, obscure mealiness, and smaller loosely clustered flowers.

C. úrbicum, in waste grounds, is dull green, scarcely mealy, the triangular leaves coarsely and sharply many-toothed, flower-clusters in dense panicled spikes, and seed with rounded margins.

C. hýbridum, MAPLE-LEAVED G. Waste grounds, unpleasantly scented like Stramonium, bright green throughout; the widely branching stem 2° - 4° high; the thin large leaves triangular and heart-shaped, sinuate and angled, the angles extended into a few taper-pointed coarse teeth; racemes in loose and leafless panicles; seed sharp-edged.

§ 2. *Not mealy or scurfy, but minutely glandular or pubescent, aromatic-scented: the seed sometimes vertical.* ① ②

C. Botrys, JERUSALEM OAK or FEATHER GERANIUM. Gardens and some roadsides: low, spreading, almost clammy-pubescent, sweet-scented; leaves sinuate-pinnatifid, slender-petioled; racemes loosely corymbed.

C. ambrosioides, MEXICAN TEA, WORMSEED. Waste grounds, especially S.: rather stout, smoothish, strong-scented; leaves oblong or lanceolate, varying from entire to cut-pinnatifid, nearly sessile; spikes dense, leafy or leafless. This, especially the more cut-leaved var. ANTHELMÍNTICUM, is used as a vermifuge, and yields the *wormseed-oil.*

94. AMARANTACEÆ, AMARANTH FAMILY.

Weeds and some ornamental plants, chiefly herbs, essentially like the foregoing family, but the flowers provided with dry and mostly scarious crowded persistent bracts, and the fruit sometimes several-seeded. The cultivated sorts are ornamental, like Immortelles, on account of their colored dry bracts which do not wither.

§ 1. *Leaves alternate, mostly long-petioled: anthers 2-celled.*

1. AMARANTUS. Flowers monœcious or polygamous, each with 3 bracts. Calyx of 5, or sometimes 3, equal erect sepals, smooth. Stamens 5, sometimes 2 or 3. Stigmas 2 or 3. Ovule solitary, on a stalk from the base of the ovary. Fruit an utricle, 2–3-pointed at apex, usually opening all round transversely, the upper part falling off as a lid (Lessons, p. 130, fig. 298), discharging the seed. Flowers in axillary or terminal spiked clusters.
2. CELOSIA. Flowers perfect. Ovules and seeds numerous. Otherwise nearly as Amarantus, but the crowded spikes imbricated with shining colored bracts. In cultivation the spikes are often changed into broad crests.

§ 2. *Leaves opposite: anthers 1-celled.*

3. GOMPHRENA. Flowers perfect, chiefly in terminal round heads, crowded with the firm colored bracts. Calyx 5-parted or of 5 sepals. Stamens 5, monadelphous below: filaments broad, 3-cleft at summit, the middle lobe bearing a 1-celled anther (Lessons, p. 114, fig. 239). Utricle 1-seeded.

Achyránthes or **Iresine Verschafféltii** is lately cult. for its red foliage, a poor substitute for Coleus, except in shade, where it has clear red stems, its ovate or roundish opposite leaves strongly veined or blotched with red, or wholly crimson.

Iresine celosioides, a wild tall weed, with opposite leaves, and panicles of small white-woolly flowers, is common S. W.

Acnida cannábina, in salt-marshes along the coast, is a tall annual, like an Amaranth, but diœcious, bracts inconspicuous, and the fleshy indehiscent fruit 3–5-angled and crested.

1. AMARÁNTUS, AMARANTH. (From Greek for *unfading.*) Coarse weeds of cult. and waste grounds, and one or two cultivated for ornament: fl. late summer. Bracts commonly awn-pointed. ①

§ 1. RED AMARANTHS, *the flower-clusters or the leaves tinged with red or purple.*

A. caudàtus, PRINCES' FEATHER. Cult. from India: tall, stout; leaves ovate, bright green; spikes red, naked, long and slender, in a drooping panicle, the terminal one forming a very long tail.

A. hypochondriacus. Cult. from Mexico, &c.: stout; leaves oblong, often reddish-tinged; flower-clusters deep crimson-purple, short and thick, the upper making an interrupted blunt spike.

A. paniculàtus. Coarse weed in gardens: the oblong-ovate or lance-oblong leaves often blotched or veined with purple; flowers in rather slender purplish-tinged spikes collected in an erect terminal panicle.

A. melanchólicus, LOVE-LIES-BLEEDING. Cult. from China or India: rather low; stems and stalks red; the ovate thin leaves dark purple or partly green; or, in var. TRICOLOR, greenish with red or violet and yellow variously mixed; sepals and stamens only 3.

§ 2. GREEN AMARANTHS, or PIGWEEDS, *flowers and leaves green or greenish.*

A. retrofléxus, COMMON PIGWEED: erect, roughish-pubescent or smoother; spikes crowded in a stiff panicle, the awn-pointed bracts rigid.

A. spinòsus, THORNY A. Waste ground, chiefly S.: dull green leaves, with a pair of spines in their axils; flowers small, yellowish-green, in round axillary clusters and in a long terminal spike.

A. álbus. Roadsides and streets, spreading over the ground; with obovate and spatulate leaves, flowers all in small clusters in their axils and covered by rigid sharp-pointed bracts; sepals 3; stamens 2 or 3.

2. CELÒSIA, COCKSCOMB. (Name in Greek means *dried*, alluding to the scarious bracts.) Fl. summer. ①

C. cristàta, COMMON C. of the gardens, from India, in various usually monstrous forms, the showy flower-crests crimson-red, sometimes rose-colored, yellow, or white.

3. GOMPHRÈNA. (Ancient name of an Amaranth.) Fl. summer.

G. globòsa, GLOBE AMARANTH or BACHELOR'S-BUTTON. Cult. from India: *low, branching, pubescent, with oblong nearly sessile leaves,* and dense round heads crimson, rose-color, or white.

95. POLYGONACEÆ, BUCKWHEAT FAMILY.

Known by the alternate entire leaves having stipules in the form of scarious or membranous sheaths at the strongly marked usually tumid joints of the stem. Flowers mostly perfect, on jointed pedicels, with green or colored 4–6-parted usually persistent or withering calyx, 4–9 stamens on its base, 2 or 3 stigmas, 1-celled ovary with a single ovule rising from its base (Lessons, p. 122, fig. 268), forming an akene or nutlet. Embryo mostly on the outside of mealy albumen, the radicle pointing to the apex of the fruit.

ERIÓGONUM differs in having no obvious stipules, and the flowers from a cup-shaped involucre. There are a few species of the genus S. and S. W., and many near and beyond the Rocky Mountains.

§ 1. *Calyx of 5, rarely 4, more or less petal-like similar sepals, erect after flowering.*

1. POLYGONUM. Flowers in racemes, spikes, or else in the axils of the leaves. Akene either lenticular when there are 2 stigmas, or triangular when there are 3. Embryo curved round one side of the albumen: cotyledons narrow.
2. FAGOPYRUM. Differs from one section of Polygonum mainly in having an embryo in the centre of the albumen, which is divided into 2 parts by the very broad leaf-like cotyledons. The triangular akene longer than the calyx.

§ 2. *Calyx of 6 sepals often of two sorts: styles 3.*

3. RHEUM. Sepals all similar, petal-like, withering-persistent underneath the 3-winged fruit. Stigmas capitate or wedge-shaped. Stamens 9.
4. RUMEX. Sepals of 2 sorts; the 3 outer ones herbaceous and at length spreading; the alternate inner 3 larger, somewhat colored, enlarging after flowering, becoming veiny and dry, often bearing a grain-like tubercle on the back, and convergent over the 3-angled akene. Stigmas a hairy tuft. Stamens 6.

1. POLÝGONUM, KNOTWEED, JOINTWEED. (The name in Greek means *many-jointed.*) Chiefly weeds; some with rather showy flowers; the following are the commonest: fl. late summer and autumn.

§ 1. *Flowers along the stem, nearly sessile in the axils of the almost sessile linear or oblong leaves, small, greenish-white: sheaths scarious, usually cleft or torn and fringed.* ①

P. aviculàre, KNOT-GRASS, GOOSE-GRASS, or DOORWEED. Prostrate or spreading and variable low weed, with pale lanceolate or oblong leaves, commonly 5 stamens, and dull 3-sided akene enclosed in the calyx. Var. ERÉCTUM, has more upright stems, and larger oblong or oval leaves.

P. ramosissimum. Chiefly W. in sandy soil: with nearly erect much-branched and rigid striate stems 2°–4° high; lanceolate or linear leaves tapering into a petiole, and a glossy akene; sepals 6 and stamens 6 or 3, or else sepals 5 with 4 or 5 stamens.

P. ténue. Rocky dry soil: slender, upright, with thread-like branches, along which the upper flowers form a loose leafy spike; leaves narrow linear, acute; akene shining.

§ 2. *Flowers collected in terminal spikes or spike-like racemes, rose-purple or flesh-color, or rarely white or greenish.*

* *Leaves small and thread-like or at length none: the sheaths truncate, naked, rigid: many-jointed raceme with a single flower under each bract.*

P. articulàtum. Sandy shores and barrens: a slender little plant, bushy-branching, 4′ – 12′ high; flowers rose-colored, nodding; stamens 8; akene triangular. ①

* * *Leaves ovate, short-petioled: sheaths cylindrical, fringed-hairy: greenish flowers 1 – 3 from each bract of the long and slender spikes, unequally 4-parted; the 2 styles reflexed on the lenticular akene and hooked at the tip.*

P. Virginiànum. Thickets: 2° – 4° high, nearly smooth; leaves rough-ciliate, 3′ – 6′ long; flower somewhat curved; stamens 5. ♃

* * * *Leaves lanceolate, oblong, or ovate, chiefly petioled: sheaths cylindrical: flowers several from each bract of the spike, 5-parted.*

+ *Sheaths mostly with an abruptly spreading foliaceous border (which sometimes falls off): tall, 3° – 8° high, with dense cylindrical nodding spikes of rose-colored flowers, and flat akenes.*

P. orientàle, Princes' Feather. Gardens and cultivated grounds, from India: with large ovate pointed leaves, and 7 stamens.

P. Càreyi. Swamps from Pennsylvania N. & E.: with lanceolate leaves, glandular bristly peduncles, and 5 stamens.

+ + *Sheaths truncate, without a border.*

++ *Herbage and flowers not acrid nor punctate with pellucid glands or dots.*

= *In moist soil: leaves lanceolate: plants nearly smooth.* ①

P. incarnàtum. Tall, 3° – 6° high; leaves tapering from near the base to a narrow point (4′ – 12′ long); sheaths smooth and naked; peduncles rough with scattered sessile glands; spikes linear, nodding; flowers flesh-color or pale rose; the 6 stamens and 2 styles included; akene flat with concave sides.

P. Pennsylvánicum. Stems 1° – 3° high, the branches above and peduncles bristly with stalked glands; sheaths naked; spikes oblong, thick and blunt, erect; flowers rose-purple; stamens 8, a little protruding; style 2-cleft; akene with flat sides.

P. Persicària, Lady's Thumb. Nat. from Eu. near dwellings, about 1° high: upper face of leaves with a dark blotch near the middle; sheaths somewhat bristly-ciliate; spikes oblong, dense, erect, on naked peduncles; flowers greenish-purple; stamens mostly 6; style 2 – 3-cleft; akene either flattish or triangular.

= = *In water: stems rooting below.* ♃

P. amphíbium. Water P. Chiefly N.: stems often simple bearing a single ovate or oblong dense spike or head of pretty large and showy rose-red flowers; leaves oblong, heart-oblong, lance-ovate or lanceolate, mostly long-petioled, often floating; sheaths not fringed; stamens 5; style 2-cleft.

P. hydropiperoìdes. Commonest S.: stems slender, rising out of shallow water 1° – 3° high; leaves narrowly lanceolate or lance-oblong; sheaths hairy and fringed with long bristles; spikes erect, slender; flowers small, pale or white; stamens 8; style 3-cleft; akene sharply triangular.

++ ++ *Herbage (smooth) pungently acrid: leaves and pale sepals marked with pellucid dots or glands, in which the acrid quality resides: sheaths fringed with bristles.*

P. àcre, Water Smartweed. Shallow water or wet soil: stems rooting at the decumbent base, rising 2° – 4° high; leaves lanceolate or linear, taper-pointed; spikes slender, erect; flowers whitish or pale flesh-color; stamens 8; akene sharply triangular, shining. ♃

P. Hydrópiper, COMMON S. or WATER PEPPER. Low or wet grounds N.: 1°–2° high; leaves oblong-lanceolate; spikes nodding, mostly short; flowers greenish-white; stamens 6; akene either flat or obtusely triangular. ①

* * * * *Leaves heart-shaped or arrow-shaped, petioled: sheaths half-cylindrical.*

+ TEAR-THUMB. *Stems with spreading branches, the angles and petioles armed with sharp reflexed prickles, by which the plant is enabled almost to climb: flowers in peduncled heads or short racemes, white or flesh-color.* ①

P. arifòlium. Low grounds: leaves halberd-shaped, long-petioled; the peduncles glandular-bristly; stamens 6; styles 2; akene lenticular.

P. sagittàtum. Low grounds: leaves arrow-shaped, short-petioled; the peduncles naked; stamens mostly 8; styles 3; akene sharply 5-angled.

+ + BLACK BINDWEED. *Stems twining, not prickly: flowers whitish, in loose panicled racemes: three outermost of the 5 divisions of the calyx keeled or crested, at least in fruit: stamens 8: styles 3: akenes triangular.*

P. Convólvulus. Low twining or spreading weed from Eu., in cultivated fields, &c.: smoothish, with heart-shaped and almost halberd-shaped leaves, and very small flowers. ①

P. cilinòde. Rocky shady places: tall-twining, rather downy, a ring of reflexed bristles at the joints; leaves angled-heart-shaped; outer sepals hardly keeled. ♃

P. dumetòrum, CLIMBING FALSE BUCKWHEAT. Moist thickets: tall-twining, smooth; joints naked; leaves heart-shaped or approaching halberd-shaped; panicles leafy; outer sepals strongly keeled and in fruit irregularly winged. ♃

2. FAGOPỲRUM, BUCKWHEAT. (The botanical name, from the Greek, and the popular name, from the German, both denote *Beech-wheat*, the grain resembling a diminutive beech-nut.) Cult. from N. Asia, for the flour of its grain: fl. summer. ①

F. esculéntum, COMMON B. Nearly smooth; leaves triangular-heart-shaped inclining to halberd-shaped or arrow-shaped, on long-petioles; sheaths half-cylindrical; flowers white or nearly so in corymbose panicles; stamens 8, with as many honey-bearing glands interposed; styles 3; acutely triangular akene large.

F. tartáricum, TARTARY or INDIAN WHEAT. Cult. for flour on our N. E. frontiers and N.: like the other, but flowers smaller and tinged with yellowish; grain half the size, with its less acute angles wavy.

3. RHÈUM, RHUBARB. (Name said to come from the Greek, and to refer to the purgative properties of the root; that of several species, of N. Asia, yield officinal *rhubarb*.) ♃

R. Rhapónticum, GARDEN R. or PIE-PLANT; the large fleshy stalks of the ample rounded leaves, filled with pleasantly acid juice, cooked in spring as a substitute for fruit; flowers white, in late spring.

4. RÙMEX, DOCK, SORREL. (Old Latin name.) The three enlarged sepals which cover the fruit are called *valves*. Flowers greenish, in whorls on the branches, forming panicled racemes or interrupted spikes.

§ 1. DOCK. *Herbage bitter: flowers perfect or partly monœcious, in summer.*

* *In marshes: stem erect, stout: leaves lanceolate or lance-oblong, flat, not wavy: valves entire or obscurely wavy toothed in the first species.* ♃

R. orbiculàtus, GREAT WATER DOCK. Common N.: 5°–6° high; leaves often 1°–2° long; flowers nodding on slender pedicels; the valves round-ovate or almost orbicular, thin, finely reticulated, nearly ¼′ wide, each bearing a grain.

R. Británnica, PALE D. Commoner S.: 2°–6° high; pedicels nodding, shorter than the fruiting calyx, which has broadly ovate loosely reticulated valves, one with a large grain, the others commonly naked; root yellow.

R. salicifòlius, White D. Salt marshes: 1°–3° high; pedicels much shorter than the fruiting calyx and in much-crowded whorls, forming a spike; valves more triangular than in the foregoing and smaller, their grain very large; root white.

R. verticillàtus, Swamp D. Common N.: 3°–5° high; whorls loose; fruit-bearing pedicels slender and club-shaped, abruptly reflexed; valves somewhat rhombic and with narrow blunt apex, each bearing a very large grain; leaves thickish, the lowest often heart-shaped at base.

* * *Weeds nat. from Europe in cult. or waste ground: stem erect, 2°–4° high: lower leaves or some of them heart-shaped at base, all more or less wavy: root commonly yellow and spindle-shaped.* ♃

R. críspus, Curled D. Leaves green, lanceolate, very wavy-curled, the lower rather truncate than heart-shaped at base; whorls crowded in long racemes; valves rounded, heart-shaped, nearly entire; mostly grain-bearing.

R. sanguíneus, Bloody-veined or Red D. Leaves less curled and red-veined, lanceolate or oblong; whorls distant; pedicels very short; valves narrowly oblong, one or more grain-bearing.

R. obtusifòlius, Bitter D. Leaves little wavy, the upper lance-oblong and acute, lower oblong-heart-shaped and obtuse; whorls loose and distant; valves ovate, partly halberd-shaped, beset with some long sharp teeth near the base, usually only one grain-bearing.

* * * *Sandy sea-shore and river-banks N.: 5′–12′ high, spreading.* ①

R. marítimus. Minutely pubescent; leaves lance-linear, wavy-margined, the lower auricled or heart-shaped at base; whorls much crowded into leafy spikes; valves rhombic-oblong with a tapering point, turning orange-colored, a large grain on the back and 2 or 3 long stout bristles on each margin.

§ 2. Sorrels. *Herbage acid: some leaves halberd-shaped, others with entire narrowed base: flowers diœcious, small, in a terminal naked panicle: valves naked: fl. spring and summer.* ♃

R. Acetosélla, Common or Sheep Sorrel. Low weed in all sterile fields; leaves lance-oblong or halberd-shaped, the lobes or auricles narrow; pedicels jointed with the flower; ovate valves hardly enlarging in fruit.

R. Engelmánni, only S. & W., differs in pedicels jointed near the middle, and thin rounded heart-shaped valves becoming many times larger than the akene.

96. LAURACEÆ, LAUREL FAMILY.

Spicy-aromatic trees or shrubs, the alternate simple leaves (with entire margins but sometimes lobed) more or less marked with minute pellucid dots; the regular flowers with a calyx of 4 or 6 sepals imbricated in two ranks in the bud, and free from the ovary; the latter is terminated by a simple style and stigma, is 1-celled with a hanging ovule, and in fruit becomes a berry or drupe. The stamens (in ours 9) furnish a special character, their anthers opening by uplifted valves! To this family belong the classical Laurel or Bay, the Cinnamon, the Camphor-tree, &c.

* *Flowers perfect, in axillary panicles.*

1. PERSEA. Calyx 6-parted, persistent at the base of the berry. Stamens 9 with anthers, the 3 outer of which are turned outwards, the 6 others inward; also 3 glands or sterile filaments forming an innermost row. The two proper cells of the anther with a lower and an upper chamber, making 4 compartments, each opening by a valve in the manner of a trap-door.

* * *Flowers wholly or nearly diœcious, greenish-yellow, leaves deciduous.*

2. SASSAFRAS. Flowers in an open corymbed and peduncled cluster, with spreading 6-parted calyx: sterile ones with 9 stamens in 3 rows, the filaments of the three inner with a pair of yellow stalked glands on their base. Anthers with 4 chambers as in the preceding. Fertile flowers with 6 rudiments of

3. LINDERA. Flowers in sessile lateral clusters, with a 6-parted honey-yellow calyx: sterile ones with 9 stamens having simply 2-celled and 2-valved anthers; the inner 3 filaments lobed and glandular at base. Fertile flowers with a globular ovary, surrounded by numerous rudiments of stamens. Berry red, oval; the stalk not thickened.

4. TETRANTHERA. Flowers in small lateral clustered umbels, with 6-parted deciduous calyx: sterile ones with 9 similar stamens; anthers turned inwards, the 2 cells with 2 chambers, each opening by a valve, as in Sassafras. Fertile flowers with a globular ovary, surrounded by numerous rudiments of stamens, and becoming a globular drupe or berry.

1. PÉRSEA, RED BAY. (Ancient of some Oriental tree.) Leaves evergreen: flowers greenish-white, in summer.

P. Carolinénsis, CAROLINA RED BAY. Tree or large shrub, in low grounds, from Delaware S.: hoary when young, the oblong leaves soon smooth above; berries blue on a red stalk.

2. SÁSSAFRAS. (The popular name of this very well-known tree.)

S. officinàle, SASSAFRAS. In rich woods: a fine tree with mucilaginous yellowish twigs and foliage, spicy bark, flowers appearing in spring with the leaves; these ovate and obovate, and some of them 3-cleft, smooth when old; fruit blue on a club-shaped rather fleshy stalk.

3. LÍNDERA, SPICEBUSH, WILD ALLSPICE, FEVERBUSH. (Named for *J. Linder*, a Swedish botanist.) Genus also named BENZOIN. Shrubs: fl. in spring, preceding the leaves.

L. Benzòin, COMMON S. or BENJAMIN-BUSH. Damp woods: 6° – 15° high, almost smooth; leaves thin, obovate-oblong, acute at base, 3′ – 5′ long.

L. melissæfòlia. Wet grounds S.: 2° – 3° high, silky-pubescent; leaves oblong, obtuse or slightly heart-shaped at base, 1′ – 2′ long, when old smooth above.

4. TETRANTHÈRA. (Name in Greek means *four anthers*, alluding to the 4 chambers to each anther.)

T. geniculàta, POND SPICE. Along ponds in pine-barrens from Virginia S.: large shrub, soon smooth, with forking and divergent or zigzag branches, rather coriaceous oval or oblong leaves ($\frac{1}{2}$′ – 1′ long), appearing later than the flowers in spring; these in little crowded clusters of 2 – 4 from 2 – 4-leaved involucres; fruit red, globular.

97. THYMELEACEÆ, MEZEREUM FAMILY.

Shrubs with acrid and very tough fibrous bark, entire leaves, and perfect flowers, having a simple corolla-like calyx, bearing twice as many stamens as its lobes (usually 8), the anthers of the ordinary sort; the free ovary one-celled, with a single hanging ovule, becoming a berry-like fruit. Flowers commonly in umbel-like clusters.

1. DAPHNE. Calyx salver-shaped or somewhat funnel-shaped; the 4 lobes spreading, the 8 anthers nearly sessile on its tube, included. Style very short or none: stigma capitate.

2. DIRCA. Calyx tubular, without any spreading lobes, the wavy-truncate border sometimes obscurely indicating 4 teeth. The 8 stamens and the style long and slender, protruding.

1. DÁPHNE. (Mythological name, the nymph transformed by Apollo into a Laurel.) The following cult. for ornament from the Old World.

D. Mezèreum, MEZEREUM. Hardy low shrub from Europe, 1° – 3° high, with purple-rose-colored (rarely white) flowers, in lateral clusters on shoots of the preceding year, in early spring, before the lanceolate very smooth green leaves; berries red.

D. Cneòrum. Hardy under-shrub from Eu., spreading and branching, with crowded lance-oblong or oblanceolate evergreen leaves (less than 1′ long), and a terminal cluster of handsome rose-pink flowers in spring.

D. odòra, Sweet Daphne. Greenhouse shrub from China, with bright green lance-oblong evergreen leaves, and terminal clusters of white or pale pink sweet-scented flowers, in winter.

2. DÍRCA, LEATHERWOOD, MOOSE-WOOD. (Classical Greek name of a celebrated fountain.)

D. palústris, the only species, in damp woods chiefly N.: shrub 2°–6° high, with tender white wood, but very tough bark, used by the Indians for thongs (whence the popular names), the numerous branches as if jointed; leaves obovate or oval, alternate, nearly smooth, deciduous; flowers before the leaves in earliest spring, honey-yellow, few in a cluster from a bud of 3 or 4 dark-hairy scales forming an involucre; berry reddish.

98. ELÆAGNACEÆ, OLEASTER FAMILY.

Silvery-scurfy shrubs or small trees, having often diœcious inconspicuous flowers, the calyx-tube of the fertile ones itself enclosing the ovary, becoming fleshy and ripening into a sort of berry, around the akene-like true fruit, the seed of which is erect. Otherwise much like the preceding family.

Shephérdia Canadénsis, a low shrub along our northern borders, with opposite oval leaves, soon green above, but silvery and with some rusty scurf beneath, diœcious 4-parted flowers, and yellow berries.

S. argéntea, Buffalo-Berry, shrub through the plains and mountains far W. and N. W., and planted for ornament, has alternate oblong leaves with narrowed base, silvery both sides, and edible acid red berries.

Elæágnus argéntea, Silver-Berry of the far West, also cult., with oval silvery leaves and mealy edible berries; the genus known by the mostly perfect flowers with salver-shaped calyx, the stamens only as many as the lobes, usually 4. — One or two Old World species are occasionally planted.

99. SANTALACEÆ, SANDALWOOD FAMILY.

Represented by one or two shrubs along the Alleghanies S., one of them the Pyrulària oleífera, the Oil-nut or Buffalo-nut, — and widely by a low herb, viz.

1. Comándra umbellàta. Dry ground, common N.: probably parasitic on the roots of shrubs. Known by the 5 stamens with their anthers connected with the face of the white calyx-lobes behind them by a tuft of thread-like hairs (to which the name, from the Greek, alludes); tube of the calyx coherent below with the ovary, becoming a hard or nut-like fruit, filled by a globular seed. Stems 6′–10′ high, with many small oblong pale leaves.

100. LORANTHACEÆ, MISTLETOE FAMILY.

Parasitic on the branches of trees, represented only, through the Middle and Southern States, by

Phoradéndron flavéscens, American Mistletoe; with obovate or oval, yellowish-green, thick, slightly petioled leaves, and short yellowish jointed spikes in their axils, of diœcious greenish flowers, the fertile ones ripening white berries.

101. SAURURACEÆ, LIZARD'S-TAIL FAMILY.

A very small family, having a single Eastern North American representative in

Saurùrus cérnuus, Lizard's-tail. Wet swamps: fl. summer; stem jointed, 2° high, branching; leaves heart-shaped, with converging ribs, petioled; flowers white, crowded in a dense but slender tail-like spike, with the end nodding, perfect, but with neither calyx nor corolla; stamens 6 or 7, with long slender white filaments; *pistils 3 or 4, slightly united at base.* (Lessons, p. 90, 180.)

102. EUPHORBIACEÆ, SPURGE FAMILY.

Plants with mostly milky acrid juice and monœcious or diœcious flowers, of very various structure; the ovary and fruit commonly 3-celled and with single or at most a pair of hanging ovules and seeds in each cell.

§ 1. *Ovules and seeds only one in each cell.*

* *Flowers both staminate and pistillate really destitute both of calyx and corolla: a pistillate and numerous staminate surrounded by a cup-like involucre which imitates a calyx, so that the whole would be taken for one perfect flower.*

1. EUPHORBIA. For the structure of the genus, which is recondite, see Manual, and Structural Botany, fig. 1143. These plants may be known, mostly, by having the 3-lobed ovary raised out of the cup, on a curved stalk, its 3 short styles each 2-cleft, making 6 stigmas. Fruit when ripe bursting into the 3 carpels, and each splitting into 2 valves, discharging the seed. What seems to be a stamen with a jointed filament is really a staminate flower, in the axil of a slender bract, consisting of a single stamen on a pedicel, the joint being the junction.

* * *Flowers of both kinds provided with a distinct calyx.*

2. STILLINGIA. Flowers in a terminal spike, naked and staminate above, a few fertile flowers at base. Calyx 2–3-cleft. Stamens 2, rarely 3. Pod 3-lobed. Stigmas 3, simple. Bracts with a fleshy gland on each side. Leaves alternate, stipulate.
3. ACALYPHA. Flowers in small clusters disposed in spikes, staminate above, fertile at base; or sometimes the two sorts in separate spikes. Calyx of sterile flowers 4-parted, of fertile 3–5-parted. Stamens 8–16, short, monadelphous at base; the 2 cells of the anther long and hanging. Styles 3, cut-fringed on the upper face, red. Pod of 3 (rarely 2 or 1) lobes or cells. Fertile flower-clusters embraced by a leaf-like cut-lobed bract. Leaves alternate, petioled, with stipules, serrate.
4. RICINUS. Flowers in large panicled clusters, the fertile above, the staminate below. Calyx 5-parted. Stamens very many, in several bundles. Styles 3, united at base, each 2-parted, red. Pod large, 3-lobed, with 3 large seeds. Leaves alternate, with stipules.
5. JATROPHA. Flowers in cymes or panicles; the fertile in the main forks. Calyx colored like a corolla, in the sterile flowers mostly salver-shaped and 5-lobed, enclosing 10–30 stamens, somewhat monadelphous in two or more ranks; in the fertile 5-parted. Styles 3, united below, once or twice forked at the apex. Pod 3-celled, 3-seeded. Leaves alternate, long-petioled, with stipules.

§ 2. *Ovules and mostly seeds 2 in each cell of the ovary and 3-horned pod. Juice not milky in the following: which have monœcious flowers, 4 sepals, 4 exserted stamens in the sterile, and 3 awl-shaped spreading or recurved styles or stigmas in the fertile flowers.*

6. BUXUS. Flowers in small sessile bracted clusters in the axils of the thick and evergreen entire opposite leaves. Shrubs or trees.
7. PACHYSANDRA. Flowers in naked lateral spikes, staminate above, a few fertile flowers at base. Filaments long, thickish and flat, white. Nearly herbaceous, low, tufted: leaves barely evergreen, alternate, coarsely few-toothed.

1. EUPHÓRBIA, SPURGE. (Said to be named for *Euphorbus*, physician to King Juba.) Flowers commonly in late summer.

§ 1. *Shrubby species of the conservatory, winter-flowering, with red bracts or leaves.*

E. pulchérrima, or POINSETTIA, of Mexico: unarmed stout shrub, with ovate or oblong and angled or sinuately few-lobed leaves, rather downy beneath, those next the flowers mostly entire (4′–5′ long) and of the brightest vermilion-red; flowers in globular greenish involucres bearing a great yellow gland at the top on one side.

E. spléndens, of the Mauritius: smooth with thick and horridly prickly stems, oblong-spatulate mucronate leaves, and slender clammy peduncles bearing a cyme of several deep-red apparently 2-petalous flowers; but the seeming petals are bracts around the cup-like involucre of the real flowers.

E. fúlgens, or JACQUINIÆFLÒRA, of Mexico: unarmed, smooth, with slender recurved branches and broadly lanceolate leaves, few-flowered; peduncles shorter than the petioles, what appears like a 5-cleft corolla are the bright red lobes of the involucre.

§ 2. *Herbs natives of or naturalized in the country, the first and last and sometimes a few of the others cult. in gardens: fl. late summer.*

* *The leaves which are crowded next the flower-cups or involucres have their margins or a part of the base colored (white or red): stem erect, 1°–3° high.* ①

E. marginàta. Wild on the plains W. of the Mississippi, and cult. for ornament: leaves pale, ovate or oval, sessile, the lower alternate, uppermost in threes or pairs and broadly white-margined; flower-cup with 5 white petal-like appendages behind as many saucer-shaped glands.

E. heterophýlla. Rocky banks S. W.: smooth; leaves alternate, ovate and sinuate-toothed, or fiddle-shaped, or some of them lanceolate or linear and entire; the upper with red base; no petal-like appendages to the flower-cup and only 1 or 2 sessile glands.

E. dentàta. Rich soil from Penn. S. W.: hairy, only the lower leaves alternate, the upper opposite, varying from ovate to linear, uppermost paler or whitish at base, and the few glands of the flower-cup short-stalked.

* * *The leaves none of them colored: but the flower-cup with 5 bright-white conspicuous appendages, imitating a 5-cleft corolla.* ♃

E. corollàta. Gravelly or sandy soil, from New York S. & W.: 2°–3° high; leaves varying from ovate to linear, entire, the lower alternate, upper whorled and opposite; flower-cups umbelled, long-stalked.

* * * *Leaves all alike and opposite, green, or with a brown-red spot, short-petioled, with scaly or fringed-cut stipules: stems low-spreading or prostrate, repeatedly forked: a small flower-cup in each fork, bearing 4 glands, each bordered with a more or less petal-like white or reddish margin or appendage. Of these there are several species, insignificant weeds; these two are the commonest everywhere in sandy or gravelly open places.*

E. maculàta. Prostrate; leaves oblong-linear, very oblique at base, serrulate above, blotched in the centre; pods sharp-angled, very small.

E. hypericifòlia. Ascending 10′–20′ high; leaves ovate-oblong or linear-oblong, serrate, often with red spot or margins; pod blunt-angled; seeds wrinkled.

* * * * *Leaves without stipules, none with colored margins or spots: the flower-cups also green or greenish, umbelled, their glands wholly destitute of any petal-like appendage.*

+ *Leaves of the commonly erect stem alternate or scattered; those of the umbel-like inflorescence whorled or opposite and of different shape, usually roundish: glands of the flower-cup mostly 4. Weeds or weed-like.*

++ *Glands of the flower-cup transversely oval and obtuse.* ①

E. platyphýlla. Nat. from Europe N.: upper stem-leaves lance-oblong, acute, minutely serrulate; uppermost heart-shaped; floral ones triangular-ovate and heart-shaped; umbel 5-rayed; glands large and sessile; pod beset with depressed warts; seed smooth.

E. obtusàta. Native W. & S.: like preceding, but taller, 1°–2° high; stem-leaves oblong-spatulate and obtuse, the upper heart-shaped; floral ones dilated-ovate; umbel once or twice 3-rayed, then 2-rayed; glands of flower-cup short-stalked; pods long-warty.

E. dictyospérma. Open ground S. W. Resembles the preceding, but slender; leaves obtusely serrate; glands small, almost sessile; seeds delicately reticulated.

E. Helioscòpia. Weed from Europe in waste places N.: with stouter ascending stems 6′–12′ high; leaves all obovate and rounded or notched at the end, the lower wedge-shaped, finely serrate; umbel first with 5, then 3, and at length with 2 rays; glands orbicular and stalked; pods smooth and even; seeds with honeycomb-like surface.

++ ++ *Glands of the flower-cup with 2 long horns: pod smooth: seeds sculptured or pitted and pale.* ① ②

E. Péplus. Waste places, from Eu.: stem erect; leaves petioled, entire, round-obovate, the upper floral ones ovate; umbel first 3-rayed, afterwards 2-forked; pod 2-crested on each lobe.

E. commutàta. Wild from Wisconsin and Virginia S. W., on shady slopes: stems with decumbent base; leaves obovate, the upper sessile, the rounded floral ones broader than long; umbel 3-forked; pod crestless: fl. early summer.

++ ++ ++ *Glands crescent-shaped: pod granular: seeds smooth, dark-colored.* ♃

E. Cyparíssias, Cypress Spurge. Gardens from Eu. and running wild E.: in dense clusters 6′–10′ high, smooth; stem and branches crowded with small linear entire leaves, the floral ones small and rounded heart-shaped; umbel many-rayed.

+ + *Leaves all or chiefly opposite, entire, smooth, almost sessile: pod smooth.*

E. Ipecacuánhæ, Ipecac Spurge. Sandy soil from New York S.: branching repeatedly from the long perpendicular root, widely spreading; leaves barely 1′ long, varying from obovate to linear; peduncles solitary in the forks, slender; flower-cup dull purple, with 5 glands. ♃

E. Láthyris, Caper Spurge. Cult. from Eu. in country gardens: glaucous; stem erect, stout, 2°–3° high; leaves thick; those of the stem lance-linear, floral ones oblong-ovate and heart-shaped; umbel 4-rayed, then forking; glands short-horned. ②

2. **STILLÍNGIA.** (Named for *Dr. B. Stillingfleet.*) Very smooth plants, only S.: flowering all summer.

S. sylvática, Queen's Delight. Dry soil from Virginia S.: herb 1°–3° high, clustered from a woody root; leaves crowded, almost sessile, varying from obovate to lance-linear, serrulate; stamens 2.

S. ligustrina. River-swamps from N. Carolina S.: shrub 6°–12° high; leaves lance-obovate or oblong, entire; spikes short; stamens mostly 3.

S. sebífera, Tallow-tree of China, planted South Carolina & S.: tree 20°–40° high; leaves rhombic-ovate, entire, long-petioled; stamens 2; seeds white, yielding a useful vegetable tallow or wax.

3. **ACALÝPHA.** (Ancient Greek name of *Nettle.*) Flowering through lat summer and autumn.

A. Virgínica. A most common, coarse, low weed in fields, &c: smoothish or hairy, turning purplish, with leaves varying from ovate to linear, fertile flowers in short clusters; pod and seed smoothish. ①

A. Caroliniàna. Cult. ground, chiefly S.: has thin heart-shaped closely serrate leaves, mostly a long terminal fertile spike, pods beset with soft prickles, and seeds rough-wrinkled. ①

4. **RÍCINUS,** PALMA-CHRISTI, CASTOR-OIL PLANT. (Latin name of a bug, which the seed resembles.)

R. commùnis, the only species, but of many varieties, native probably of Africa: a sort of tree, but cult. in temperate climates as a stately annual, for its

seeds, from which *castor-oil* is expressed, and in ornamental grounds for its magnificent foliage; the peltate and palmately 7 – 11-cleft leaves 1° – 2° broad, or even more: fl. late summer.

5. JÁTROPHA. (Derivation of name obscure.) Chiefly tropical plants; one is a weedy plant wild S., viz.

J. ùrens, var. **stimulòsa** (or J. STIMULÒSA), TREAD-SOFTLY or SPURGE-NETTLE, names referring to its stinging bristly hairs, which are like those of Nettles: dry sandy soil, branching, 6′ – 12′ high; leaves rounded heart-shaped, 3 – 5-lobed or variously cleft or parted; flowers slender, white; stamens 10, their filaments almost separate. ♃

6. BÚXUS, BOX. (Ancient Latin, from the Greek name of the Box-tree.)

B. sempérvirens, TREE BOX, and its more common var. NÀNA, the DWARF BOX, with much smaller leaves, from the Mediterranean, are planted North chiefly for borders, especially the Dwarf Box.

7. PACHYSÁNDRA. (The name in Greek means *thick stamens*.) ♃

P. procúmbens. Rocky woods, W slope of the Alleghanies, and in some gardens; developing its copious spikes from the base of the short procumbent densely tufted stems, in early spring.

103. URTICACEÆ, NETTLE FAMILY.

This family, taken in the largest sense, includes very various apetalous plants, with monœcious or diœcious flowers (except in the Elm Family), having a distinct calyx free from the 1-seeded fruit. Inner bark generally tough. Leaves with stipules, which are sometimes early deciduous. There are four suborders.

I. ELM FAMILY. Trees, the juice not milky. Leaves alternate, 2-ranked, simple: stipules small and falling early. Flowers monœciously polygamous, many of them perfect, with the filaments not inflexed in the bud, and 2 diverging styles or long stigmas. Ovary 1 – 2-celled, with 1 or 2 hanging ovules, in fruit always 1-celled and 1-seeded.

* *Fruit dry, winged or nut-like. Anthers turned outwards.*

1. ULMUS. Calyx bell-shaped, 4 – 9-cleft. Stamens 4 – 9: filaments long and slender. Ovary mostly 2-celled, becoming a 1-celled thin samara or key-fruit winged all round (Lessons, p. 131, fig. 301). Flowers in clusters in axils of last year's leaves, in early spring, before the leaves of the season, purplish or yellowish-green. Leaves straight-veined, serrate.
2. PLANERA. Like Elm, but flowers more polygamous, appearing with the leaves in small axillary clusters; the lobes of the calyx and stamens only 4 or 5; the 1-celled 1-ovuled ovary forming a wingless nut-like fruit.

* * *Fruit a berry-like globular small drupe. Anthers turned inward.*

3. CELTIS. Calyx 5 – 6-parted, persistent. Stamens 5 or 6. Stigmas very long, tapering. Ovary and drupe 1-celled, 1-seeded. Flowers greenish, in the axils of the leaves; the lower ones mostly staminate and clustered, the upper fertile and mostly solitary on a slender peduncle.

II. FIG FAMILY. Trees with milky or colored acrid or poisonous juice. Leaves alternate. Flowers strictly monœcious or diœcious. Styles or stigmas commonly 2.

§ 6. *Flowers of both kinds mixed, lining the inside of a closed fleshy receptacle, or hollow flower-stalk, which ripens into what seems to be a sort of berry.*

4. FICUS. Receptacle in which the flowers are concealed borne in the axil of the leaves. Akene seed-like. Stipules large, successively enveloping the young leaves in the bud, falling off as the leaves expand.

§ 2. *Flowers of the two kinds mostly separate; the fertile crowded in catkin-like spikes or heads, which become fleshy in fruit: filaments inflexed in the bud, spreading elastically when the calyx expands.*

5. MORUS. Flowers usually monœcious, both sorts in catkin-like spikes. Calyx 4-parted. Stamens 4. Fertile spike altogether becoming an oval or oblong multiple pulpy fruit imitating a blackberry, but the pulp consists of the calyx, bracts, &c. of the flowers, each enclosing a small akene.

6. BROUSSONETIA. Flowers diœcious; the sterile in cylindrical catkins, and like those of Mulberry; the fertile in globular heads, mixed with little bristly scales, their calyx urn-shaped and 3-4-toothed, out of which the ripened ovary protrudes and forms a club-shaped rather fleshy fruit. Style single.

7. MACLURA. Flowe s diœcious: the sterile in racemes, and nearly like those of Mulberry; the fertile densely crowded in a large spherical head, its calyx of 4 unequal sepals, in fruit enclosing the small akene: the whole head ripening into a fleshy yellow mass, resembling an orange with a roughish surface.

III. NETTLE FAMILY PROPER. Herbs, as to our wild species, with bland watery juice and tough fibrous bark: many are armed with stinging hairs. Flowers monœcious or diœcious, greenish. Filaments transversely wrinkled and inflexed in the bud, straightening elastically when the calyx opens. Fruit an akene: style or stigma one and simple. — All ours worthy of notice belong to the three following genera.

8. URTICA. Flowers in racemed, spiked, or head-like clusters; the calyx in both sorts of 4 separate sepals. Stamens 4. Stigma a sessile globular tuft. Akene flat, ovate, straight and erect, enclosed between the larger pair of sepals. Herbage beset with stinging hairs: leaves opposite.

9. LAPORTEA. Flowers in loose open cymes, the upper chiefly fertile, and lower sterile; the latter with 5 sepals and stamens; the former of 4 very unequal sepals, the two outer or one of them minute. Stigma slender awl-shaped, hairy down one side, persistent on the ovate flat very oblique and nearly naked akene, which is soon reflexed on its wing-margined pedicel. Herbage beset with stings: leaves large, alternate.

10. BŒHMERIA. Flowers either diœcious or intermixed, clustered in spikes; the sterile as in Urtica; the fertile with a tubular or urn-shaped calyx barely toothed at the apex, enclosing the ovary and closely investing the oblong flat akene. No stings.

IV. HEMP FAMILY. Rough herbs, with watery juice and tough fibrous bark. Leaves mostly opposite and palmately lobed or compound. Flowers diœcious, greenish; the sterile in axillary loose compound racemes or panicles, the fertile in close clusters or catkins: calyx of the former with 5 sepals, of the latter one scale-like sepal embracing the ovary and akene. Stigmas or hairy styles two, long.

11. CANNABIS. Erect herb. Stamens 5, drooping. Fertile flowers in irregular spiked clusters. Leaves of 5-7 lanceolate irregularly toothed leaflets.

12. HUMULUS. Tall-twining. Stamens erect. Fertile flowers in solitary short catkins or spikes, 2 flowers under each of the broad thin bracts which make the scales of the strobile or hop-fruit.

1. ÚLMUS, ELM. (The classical Latin name.) Fine trees in deep, mostly moist or alluvial soil. Fl. early spring; fruit in early summer.

§ 1. *Leaves rough and harsh on the upper, soft and usually downy on the lower surface: seed in the middle of the orbicular or round-oval fruit, far away from the shallow notch: flower-clusters globular: pedicels very short.*

U. fúlva, SLIPPERY ELM. Common, rather small tree through the country, with tough reddish wood, well-known very mucilaginous inner bark, and

rusty-downy buds; leaves 4′–8′ long, doubly serrate, very rough above; these and the flowers sweet-scented in drying; calyx-lobes and stamens 7–9; fruit much less than 1′ long, the seed-bearing centre pubescent.

U. montàna, WYCH or SCOTCH ELM. Planted from Eu.: leaves smaller and less rough; buds not downy; calyx-lobes and stamens about 5; fruits 1′ long, smooth.

§ 2. *Leaves smooth above, smaller: notch at the summit of the fruit reaching nearly to the seed-bearing cell: fruit only about ½′ long.*

* *European species occasionally planted: flowers in close clusters: pedicels very short or hardly any: stamens 4 or 5? fruit smooth, round-obovate.*

U. campéstris (or GLÀBRA), ENGLISH ELM. Large tree with rather short horizontal or ascending branches; leaves 2′–4′ long, mostly or soon smooth.

U. suberòsa, EUROPEAN CORK-ELM. Probably a mere variety of the preceding, with thick plates of cork on the branches.

* * *Wild species, with the flowers soon hanging on slender stalks, which are jointed above the middle: fruit ovate or oval, with 2 sharp teeth at apex, the margin downy-ciliate at least when young.*

U. Americàna, AMERICAN or WHITE ELM. Well known large tree, with long ascending branches gradually spreading, drooping slender branchlets, which are smooth as well as the buds, not corky; the abruptly pointed leaves 2′–4′ long; flowers in close clusters, with usually 7–9 calyx-lobes and stamens; fruit smooth except the margins, its incurved points closing the notch.

U. racemòsa, CORKY WHITE ELM. Resembles the foregoing, but with downy-ciliate bud-scales; branches becoming corky, young branchlets somewhat pubescent, leaves with straighter veins, and flowers racemed.

U. alàta, WHAHOO or WINGED ELM. Virginia to Ill. and S.: small tree, with bud-scales and branchlets nearly smooth, winged plates of cork on the branches, and small thickish leaves (1′–2′ long) almost sessile.

2. PLÀNERA, PLANER-TREE. (Named for *I. J. Planer*, a German Botanist.) Flowers greenish, appearing with the leaves in early spring.

P. aquática, AMERICAN P. River swamps, from Kentucky S.: small tree, leaves ovate-oblong, smooth; fruit stalked in the calyx, beset with irregular warts or crests.

3. CÉLTIS, HACKBERRY or NETTLE-TREE. (Ancient Greek name for the *Lotus-berry*, produced by the European species.) Fl. spring: fruit ripe in autumn, eatable.

C. occidentàlis, AMERICAN H. Small or middle-sized tree, of rich low grounds; with reticulated ovate and taper-pointed serrate or entire leaves, oblique or partly heart-shaped at base, sweet thin-fleshed fruit as large as a pea. Var. PÙMILA, a straggling bush, chiefly S., only 4°–10° high.

4. FÌCUS, FIG. (The Latin, altered from the Greek name of the Fig.)

F. Cárica, COMMON FIG. Cult. from the Levant, as a house-plant N.: leaves broad, 3–5-lobed, roughish above, rather downy beneath; figs single in the axils, pear-shaped, luscious.

F. elástica, INDIA-RUBBER-TREE of E. Indies (not that of S. America): tree cult. in conservatories for its beautiful leaves, 6′–10′ long, oval-oblong, entire, thick, smooth, bright green, glossy above.

F. rèpens, from China, a delicate creeping species, fixing itself firmly by rootlets and covering walls in conservatories; leaves 1′ or less long, oblong-ovate, with unequal partly heart-shaped base.

5. MÒRUS, MULBERRY. (Old Greek and Latin name.) Leaves heart-shaped or ovate, mostly serrate, often palmately lobed; short catkin-like spikes axillary or lateral; fl. spring: fruit in summer, eatable.

M. rùbra, RED MULBERRY. Low tree, wild in rich woods or along streams; leaves rough above, downy beneath, pointed; spikes often diœcious, fruit cylindrical, red, turning dark purple.

M. nigra, Black M. Middle-sized tree, planted and sparingly run wild from the Levant; leaves rough; spikes short and short-peduncled; fruit short-oblong or globular, red turning black, pleasant-tasted.

M. álba, White M. Small tree, planted from China: the leaves feed silk-worms, these are smooth and mostly oblique at base; spikes slender-peduncled, in fruit oval or oblong, white or pale rose-color, rather insipid.

6. BROUSSONÈTIA, PAPER-MULBERRY. (Named for *Broussonet*, a French naturalist.)

B. papyrífera, of Japan. Cult. as a shade-tree from New York S.: spreading by suckers, with a very fibrous bark; leaves rough above, downy beneath, serrate, some of them ovate or slightly heart-shaped, others 3-cleft or variously lobed: flowering in spring.

7. MACLÙRA, OSAGE-ORANGE. (Named for the late *Mr. Maclure*, founder of the Academy of Natural Sciences, Philadelphia.)

M. aurantìaca, Common O., or Bois d'arc (Bow-wood, the tough yellow wood used for bows by the Indians). Low bushy tree from Arkansas, &c.: multiplying rapidly by its running roots; planted for hedges, especially W.; armed with slender and very sharp spines; leaves lance-ovate, entire, very glossy: fl. spring.

8. URTÌCA, NETTLE. (The classical Latin name.) Common in waste grounds and near dwellings: fl. summer.

* *Flower-clusters in branching panicled spikes: often diœcious.* ♃

U. dioica, Common N. A weed from Eu., full of stings, 2° – 3° high, with heart-ovate very deeply serrate leaves downy beneath.

U. grácilis. Fence-rows, &c.: 2° – 6° high, with ovate-lanceolate less deeply serrate leaves, longer petioles, rather few stings, and slender spikes.

* * *Flower-clusters shorter than the petiole, mostly 2 in the same axil, containing both sorts of flowers: stings scattered.* ①

U. chamædryoides. Wild S. & W.: slender, with heart-ovate or lance-ovate leaves moderately toothed, and dense flower-clusters.

U. ùrens, Small N. Weed from Eu., not common: 8′ – 12′ high, with ovate leaves deeply cut into long spreading teeth; flower-clusters small, loose.

9. LAPÓRTEA, WOOD-NETTLE. (Named for one *Laporte*.) ♃

L. Canadénsis. Moist and rich woods: 2° – 3° high; ovate leaves 4′ – 7′ long and long-petioled, a single 2-cleft stipule in the axil: fl. all summer.

10. BŒHMÈRIA, FALSE-NETTLE. (Named for *Prof. Böhmer* of Germany.) ♃

B. cylíndrica. Moist shady grounds, 1° – 3° high, smoothish; leaves mostly opposite, ovate or lance-ovate, 3-nerved, serrate, long-petioled; flower-clusters crowded in long narrow interrupted spikes, in summer.

B. nívea, Ramie, or the Grass-Cloth Plant of China, &c., 3° – 4° high, with ovate leaves white-downy beneath, is recently planted S. W. for its very valuable textile fibres.

11. CÁNNABIS, HEMP. (The ancient name.) Fl. all summer. ①

C. sativa, Common Hemp. Tall coarse plant from the Old World: cult. for the fibres of its stem.

12. HÙMULUS, HOP. (Name said to be a diminutive of *humus*, the ground; the application not apparent.) Fl. summer. ♃

H. Lùpulus, Common Hop. Wild in alluvial soil N. & W.: also cult. from Eu. for hops: the aromatic bitterness resides in the yellow resinous grains which appear on the fruiting calyx, akenes, &c; stems almost prickly downwards; leaves heart-shaped and strongly 3 – 7-lobed.

104. PLATANACEÆ, PLANE-TREE FAMILY.

This order, if it may be so called, consists merely of the small genus

1. PLÁTANUS, PLANE-TREE. (The ancient name of the Oriental species, from the Greek word for *broad*, alluding either to the leaves or the wide-spreading branches.) Flowers monœcious, in separate naked heads hanging on slender peduncles; the sterile of many short stamens with club-shaped little scales intermixed; the fertile of club-shaped or inversely pyramidal ovaries mixed with little scales and tipped with a slender awl-shaped simple style, ripening into a sort of akene with a tawny-hairy contracted base. No evident calyx. Leaves alternate, palmately lobed or angled, the hollowed base of the petiole covering and concealing the axillary bud (Lessons, p. 22, fig. 50): stipules sheathing, like those of the Polygonum Family. Fl. spring.

P. occidentàlis, AMERICAN PLANE, SYCAMORE, or BUTTONWOOD. Well-known large tree by river-banks, with white close bark separating in thin brittle plates; leaves truncate or heart-shaped at base, rather scurfy-downy until old, the short lobes sharp-pointed, and fertile heads solitary.

P. orientàlis, ORIENTAL PLANE, especially its var. ACERIFOLIA, seldom planted in this country, is very like ours, but has leaves more cut and sooner smooth, the heads larger.

105. JUGLANDACEÆ, WALNUT FAMILY.

Trees with alternate pinnate leaves, no stipules, and monœcious flowers; the sterile ones in catkins with an irregular calyx and several stamens; the fertile single or 2 or more in a cluster, with a 3–5-lobed calyx, the tube of which is adherent to the ovary. The latter is incompletely 2–4-celled, but has only a single ovule, erect from its base, and ripens into a large fruit, the bony inner part of which forms the nut, the fleshy at length dry outer part the husk. Seed 4-lobed, filled with the fleshy and oily embryo, the large and separated cotyledons deeply two-lobed and crumpled or corrugated.

1. JUGLANS. Sterile flowers in solitary catkins from the wood of the preceding year, each with 12–40 stamens on very short filaments. Fertile flowers on a terminal peduncle, with a 4-toothed calyx, 4 little green petals, and 2 club-shaped and fringed conspicuous stigmas. Husk of the fruit drying up without splitting. Bark and shoots resinous-aromatic and strong-scented. Buds several, one over the other, the uppermost far above the axil (Lessons, p. 27, fig. 52). Pith in plates. Leaflets numerous.
2. CARYA. Sterile flowers in clustered lateral catkins, with 3–10 almost sessile anthers. Fertile flowers 2–5 in a cluster on a terminal peduncle: no petals: stigmas 2 or 4, large. Husk of the fruit splitting into 4 valves and falling away from the smooth nut. Valuable timber and nut trees, with very hard and tough wood, and scaly buds single (Lessons, p. 22, fig. 49), from which are usually put forth both kinds of flowers, the sterile below and the fertile above the leaves.

1. JÙGLANS, WALNUT. (Name from *Jovis glans*, the nut of Jupiter.) Fl. spring: fruit ripe in autumn. Seed sweet and edible.

* *Native trees of the country: nut with very rough and furrowed surface, from which the dried husk does not fall away: seed very oily.*

J. cinèrea, BUTTERNUT or WHITE W. Middle-sized tree, mostly N.: stalks and shoots clammy-downy; leaflets downy, at least beneath, oblong-lanceolate, pointed, serrate; fruit oblong; nut with very rugged ridges.

J. nigra. BLACK W. Large tree, commoner W. & S.: stalks and shoots not clammy, minutely downy; leaflets smoothish, ovate-lanceolate, serrate; fruit spherical.

* * *Planted from the Old World: husk friable, separating when dry from the roundish and smoothish thin-shelled nut.*

J. règia, ENGLISH WALNUT, so called, but native of Asia: leaflets oval, entire, smoothish; fruit ripens sparingly in Middle States.

2. CÁRYA, HICKORY. (Greek name of the Walnut, applied to these North American trees.) Fl. in rather late spring: nuts fall in autumn.

§ 1. *Sterile catkins in a sessile cluster: leaflets 13–15, short-stalked: nut edible.*

C. olivæfórmis, PECAN-NUT. Along rivers, from Illinois S.: leaflets oblong-lanceolate, taper-pointed; nut cylindrical-oblong, olive-shaped, the seed delicious.

§ 2. *Sterile catkins 3 or more together on a common peduncle: leaflets sessile or nearly so, of 5–9 or rarely 11–13 leaflets: nut globular or short oval.*

* *Nuts sweet-tasted and edible (the hickory-nuts of the market); the husk splitting into 4 thick and hard valves: buds large, of about 10 scales.*

C. àlba, SHELL-BARK or SHAG-BARK H. Commonest E.: bark of old trunks very shaggy, separating in rough strips; inner bud-scales becoming very large and conspicuous on the young shoot; leaflets 5, the 3 upper much larger and lance-obovate; nut white.

C. sulcàta, WESTERN SHELL-BARK H. From Penn. W. & S.: differs from the foregoing in lighter-colored heart-wood, 7–9 leaflets more downy beneath, fruit with very thick husk 4-ribbed above the middle, and larger yellowish or dull-white nut (sometimes 2′ long) mostly with a point at both ends.

C. tomentòsa, MOCKER-NUT or WHITE-HEART H. Common E. & S.: bark rough, but not splitting off in strips; shoots and lower surface of the leaves woolly-downy when young; leaflets 7–9, lance-obovate, or the lower lance-oblong; fruit with very thick hard husk, and globular nut (not flattish on the sides) brownish, very thick-shelled, hardly fit to eat.

* * *Nuts bitter, in a rather thin and friable husk, which splits only at the top, or tardily to near the base: bark on the trunk close: bud-scales falling early.*

C. porcìna, BROWN H. or PIG-NUT. Common N.: bark of trunk rough; bud-scales about 10, small; shoots and leaves nearly smooth; leaflets 5–7, obovate-lanceolate; fruit pear-shaped; nut oblong or oval, hard-shelled, seed at first sweet, then bitterish.

C. amàra, BITTER-NUT. Moist or low grounds: bark of trunk smooth and very close; yellowish bud-scales about 6; shoots and leaves pubescent when young; leaflets 7–11, lanceolate or lance-oblong; fruit and white thin-shelled and tender nut globular; seed at first sweet, then very bitter.

C. aquática, WATER H. River-swamps S. Small tree, with rough bark; bud-scales as in the last; leaflets 9–13, lanceolate, smooth; nut thin-shelled, 4-angular, flattish; seed very bitter.

106. CUPULIFERÆ, OAK FAMILY.

Trees or shrubs, with alternate and simple straight-veined leaves, very deciduous stipules, and monœcious flowers; the sterile in slender catkins (except in the Beech); the fertile solitary, clustered, or sometimes spiked, and furnished with an involucre which forms a cup or covering to the 1-celled 1-seeded nut. This nut comes from an ovary with 2 or more cells having one or two ovules hanging from the summit of each; but all except one cell and one ovule are abortive. There is a calyx adhering to the ovary, as is shown by the minute teeth crowning its summit. Seed filled by the embryo, which has thick and fleshy cotyledons.

§ 1. *Sterile flowers with a distinct 4 – 7-lobed calyx and 8 – 20 slender stamens: fertile flowers 1 – 4 in a cup or bur-like involucre.*

* *Sterile flowers clustered in slender catkins: their bracts inconspicuous or deciduous.*

1. QUERCUS. Stamens 3 – 12. Fertile flower only one in the bud-like involucre, which becomes a scaly cup. Stigma 3-lobed. Nut (acorn) terete, with a firm shell, from which the thick cotyledons do not emerge in germination. (Lessons, p. 130, fig. 299; p. 13, fig. 21, 22.)
2. CASTANEA. Stamens 8 – 20. Fertile flowers few (commonly 3) in each involucre, one or more ripening; stigmas mostly 6 or 7, bristle-shaped. Nuts coriaceous, ovoid, when more than one flattened on one or both sides, enclosed in the hard and thick very prickly bur-like at length 4-valved involucre. Cotyledons somewhat folded together and cohering, remaining under ground in germination.

* * *Sterile flowers in small heads on drooping peduncles.*

3. FAGUS. Calyx of sterile flowers bell-shaped, 5 – 7-cleft, containing 8 – 16 long stamens. Fertile flowers 2 together on the summit of a scaly-bracted peduncle; the innermost scales uniting form the 4-lobed involucre: ovary 3-celled when young, crowned by 6 awl-shaped calyx-teeth and a 3-cleft or 3 thread-like styles: in fruit a pair of sharply 3-sided nuts in the 4-cleft soft-prickly rigid involucre. Cotyledons thick, somewhat crumpled together, but rising and expanding in germination. (Lessons, p. 11, fig. 13 – 15.)

§ 2. *Sterile flowers consisting of a few short stamens partly adhering to the bract, and destitute of any proper calyx; the anthers 1-celled: fertile flowers in pairs under each bract of a head, spike, or short catkin, each with one or two bractlets, forming a foliaceous or sac-like involucre to the nut. Sterile catkins rather dense.*

4. CORYLUS. Scales of the sterile catkin consisting of a bract to the inside of which 2 bractlets and several stamens adhere. Fertile flowers in a little head, like a scaly bud: stigmas 2, long and red. Nut rather large, bony, wholly or partly enclosed in a leaf-like or tubular and cut-lobed or toothed involucre.
5. OSTRYA. Scales of the sterile catkin simple. Fertile flowers in a sort of slender catkin, its bracts deciduous, each flower an ovary tipped with 2 long slender stigmas and enclosed in a tubular bractlet, which becomes a bladdery greenish-white oblong bag, in the bottom of which is the little nut: these together form a sort of hop-like fruit.
6. CARPINUS. Sterile catkin as in Ostrya. Fertile flowers in a sort of slender loose catkin; each with a pair of separate 3-lobed bractlets, which become leaf-like, one each side of the small nerved nut.

1. **QUÉRCUS,** OAK. (The classical Latin name.) Flowers in spring; acorns ripe in autumn. All but one of the following species are natives of the country.

§ 1. *Annual-fruited Oaks, the acorns maturing the autumn of the first year, therefore on the wood of the season, usually in the axil of the leaves, out of which they are often raised on a peduncle: kernel commonly sweet-tasted: no bristles on the lobes or teeth of the leaves.*

* WHITE OAKS, *with lyrately or sinuately pinnatifid and deciduous leaves.*

+ *European tree, more or less planted eastward.*

Q. Ròbur, EUROPEAN OR ENGLISH OAK. Belongs to the same section with our White Oak; but leaves smaller, not glaucous beneath, sinuate-lobed, but hardly pinnatifid; acorn oblong, over 1′ long, — one or a few in a cluster which is nearly sessile in the axils in var. SESSILIFLÒRA, — raised on a slender peduncle in var. PEDUNCULÀTA.

+ + *Native species: leaves pale or whitish beneath.*

Q. álba, WHITE OAK. Rich soil: large tree with whitish bark; leaves soon smooth, bright green above, whitish beneath, with 3 – 9 oblong or linear obtuse and mostly entire oblique lobes; the shallow rough cup very much shorter than the ovoid-oblong (about 1′ long) acorn; seed edible.

Q. obtusíloba, POST OAK, ROUGH OR BOX WHITE OAK. Small tree in barren soil, commonest S., with very durable wood; thickish leaves grayish

downy beneath, pale and rough above, sinuately 5–7-lobed, the lobes divergent and rounded, the upper pair larger and sometimes 1–3-notched; naked cup deep saucer-shaped, half or one third the length of the small acorn.

Q. macrocárpa, BUR-OAK, OVER-CUP or MOSSY-CUP WHITE OAK. Middle-sized tree in fertile soil, commonest W.: with obovate or oblong lyrately pinnatifid leaves, of various shape, pale or downy beneath, smooth above; cup deep, thick and woody, from hardly 1′ to 2′ in diameter, covered with hard and thick pointed scales, the upper ones tapering into bristly points, making a mossy-fringed border; acorn 1′–1½′ long, half or wholly covered by the cup.

Q. lyràta, SOUTHERN OVERCUP OAK. Large tree in river-swamps, from N. Car. S. & W.: leaves crowded at the end of the branchlets, obovate-oblong, with 7–9 triangular and entire acute lobes, glossy above, whitish-downy beneath; cup sessile, globular, rough with rugged scales, almost covering the globular nut.

* * CHESTNUT-OAKS, *with toothed or sinuate leaves, not lobed except slightly in the first species, white or whitish downy beneath: cup hoary, about half the length of the oblong-ovoid edible acorn.*

Q. bícolor, SWAMP WHITE OAK. Low grounds, chiefly N. & W.: tall tree, with leaves intermediate between the White and the Chestnut Oaks, being more or less obovate and sinuate-toothed, or some of them nearly pinnatifid, hoary with soft down beneath, wedge-shaped at base, the main veins only 6–8 pairs and not prominent; peduncle in fruit longer than the petiole; cup often mossy-fringed at the margin; acorn hardly 1′ long.

Q. Prinus, CHESTNUT OAK. The leading form is SWAMP CHESTNUT OAK, in low grounds mainly S.; with obovate or oblong leaves wavy-toothed and minutely downy beneath, the main veins 10–16 pairs and prominent beneath; fruit-bearing peduncle short; the thick cup ½′–1′ wide, tubercled with the thick scales; acorn 1′ or less long. — Var. MONTÍCOLA, ROCK CHESTNUT OAK, has large acorns like the above, but more the chestnut-like leaves of the next; grows in and near the mountains. — Var. ACUMINÀTA, YELLOW CHESTNUT OAK of rich rather dry soil through the interior, mostly of the Middle States, has chestnut-like oblong or lanceolate leaves, mostly roundish at base, on slender petioles, equally and sharply toothed, and very straight-veined; cup about ½′ broad, its scales small and close; acorn rather small.

Q. prinoides, DWARF CHESTNUT or CHINQUAPIN-OAK. Barren or sandy soil, mostly E.: shrub 2°–4° high, with obovate or oblong sinuate leaves narrowed at base; and acorns and cup like those of true Chestnut Oak, but very much smaller; producing little abortive acorns in the axils of some of the scales of the cup.

* * * LIVE OAK, *with evergreen coriaceous leaves, not lobed.*

Q. virens, LIVE OAK. Barrens or sands along the coast from Virg. S. Small or large tree, or a mere shrub, with very durable firm wood, the branchlets and lower face of the small oblong entire (or rarely spiny-toothed) leaves hoary; conspicuous peduncle bearing 1–3 small fruits, with top-shaped cup and oblong acorn.

§ 2. BIENNIAL-FRUITED OAKS, *the acorns not maturing until the autumn of the second year, these therefore borne on old wood below the leaves of the season, on short and thick peduncles or none: kernel always bitter: tip or lobes of the leaves commonly bristle-pointed.*

THICKISH-LEAVED OAKS, *some of them almost or quite evergreen at the South, coriaceous but deciduous N., entire, sparingly toothed, or barely 3-lobed at the summit.*

\+ *Leaves generally entire, not widened upwards: acorns spherical, small.*

Q. cinèrea, UPLAND WILLOW OAK. Dry pine-barrens, S. E. Virginia and S. Small tree or shrub; resembles Live Oak, but more downy, narrower-leaved, the cup shallow, and small acorn globular.

Q. Phéllos, WILLOW OAK. Sandy low woods from New York S.: a middle-sized tree, remarkable for its linear-lanceolate smooth willow-like leaves narrowed at both ends,

Q. imbricària, LAUREL or SHINGLE OAK. Rather sterile soil, from New Jersey W. & S. W.: a middle-sized tree, with laurel-like lance-oblong leaves glossy above, more or less downy beneath.

+ + Leaves widening upwards, where they are sometimes moderately 3 – 5 lobed: acorns globular, ovoid, small.

Q. aquàtica, WATER OAK. Wet ground from Maryland S.: a small tree, with very smooth and glossy obovate-spatulate oblanceolate or wedge-oblong leaves long-tapering at base; cup saucer-shaped.

Q. nigra, BLACK-JACK or BARREN OAK. Barrens, from New York S. & W.: low tree (8° – 25° high), with wedge-shaped leaves widely dilated and mostly 3-lobed at summit, but often rounded at the narrow base, rusty-downy beneath, smooth and glossy above; cup top-shaped, coarse-scaly.

* * BLACK and RED OAKS, *with long-petioled and sinuate-lobed or pinnatifid deciduous leaves.*

+ Downy beneath even when mature: cup saucer-shaped with top-shaped base.

Q. ilicifòlia, BEAR or BLACK SCRUB-OAK. Sterile hills and barrens, mostly N. & W.: shrub 3° – 8° high, straggling; leaves obovate with wedge-shaped base, above angularly 3 – 7-lobed, whitish-downy beneath; acorn ovoid, barely ½′ long.

Q. falcàta, SPANISH OAK. Dry soil, New Jersey to Ill. and S.: large tree, with oblong leaves obtuse or rounded at base, 3 – 5-lobed above, grayish or yellowish-downy beneath, the lobes mostly narrow and entire or sparingly toothed and somewhat curved; acorn globular, hardly ½′ long.

+ + Mature leaves smooth on both sides or nearly so, generally ovate, oblong, or some of the larger obovate in outline, and varying from sinuately to deeply pinnatifid, turning various shades of red or crimson in late autumn: wood coarse-grained.

++ Leaves with wedge-shaped base and short petiole, rather thick and coriaceous.

Q. Catesbæi, TURKEY or BARRENS SCRUB-OAK. Small tree in pine barrens S.: leaves deeply pinnatifid or 3 – 5-cleft, the long and narrow or unequal lobes somewhat scythe-shaped and often nearly entire; cup very thick and of coarse scales, 1′ or less broad, half enclosing the ovoid nut.

++ ++ Leaves mostly rounded or obtuse at the base, slender-petioled, thinner.

Q. coccìnea, SCARLET OAK. Dry or barely moist soil: large tree, with gray bark, the interior reddish, rather firm leaves more or less glossy above and deeply pinnatifid; cup coarse-scaly, top-shaped or hemispherical with a conical scaly base, covering half or more of the roundish acorn (this ½′ – ¾′ long).

Var. **tinctòria,** QUERCITRON, YELLOW-BARKED, or BLACK OAK. Bark of trunk darker-colored, thicker, rougher, internally orange (quercitron), and much more valuable to the tanner and dyer; cup less top-shaped; leaves less pinnatifid or some of them barely sinuate, thinner, less glossy, and more like those of the next.

Q. rùbra, RED OAK. Common in rich and poor soil: large tree, with dark gray smoothish bark, very coarse reddish wood, and thinnish moderately pinnatifid leaves; cup saucer-shaped, sessile or on a short and abrupt narrow neck, of fine close scales, very much shorter than the nearly oblong acorn (this 1′ or less in length).

Q. palùstris, SWAMP SPANISH or PIN OAK. Low grounds, only N.: middle-sized tree, with less coarse wood, deeply pinnatifid smooth leaves with their divergent lobes separated by broad and rounded sinuses; cup flat-saucer-shaped with a short scaly base or stalk, of fine scales, very much shorter than the roundish acorn, which is barely ½′ in length.

2. CASTÀNEA, CHESTNUT. (Classical name, taken from that of a town in Thessaly.) Flowers in summer, appearing later than the elongated strongly straight-veined and merely serrate leaves.

C. vésca, EUROPEAN CHESTNUT: seldom planted: large tree, with oblong-lanceolate pointed leaves beset with coarse sharp-pointed teeth, when mature smooth and green both sides; nuts 2 or 3 in each involucre.

Var. **Americàna,** AMERICAN CHESTNUT: large tree in hilly woods, from Canada to Florida, distinguishable from the European only by leaves acute at the base, and nuts sweeter and smaller.

C. **pùmila,** CHINQUAPIN. Sandy dry soil chiefly S. & E.: shrub or small tree; with lance-oblong leaves whitish downy beneath, and very sweet nut solitary in the involucre, therefore terete.

3. **FÀGUS**, BEECH. (Classical Latin name, from the Greek, alluding to the nuts being good to eat.) Flowers appearing with the (straight-veined and serrate) leaves, in spring.

F. **ferrugínea,** AMERICAN BEECH. Forest tree, commoner N., with fine-grained wood, close and smooth light gray bark, and light horizontal spray; the leaves oblong-ovate and taper-pointed, distinctly toothed, thin, their silky hairs early deciduous, the very straight veins all ending in the salient teeth.

F. sylvática, EUROPEAN BEECH, occasionally planted as a shade-tree, is distinguished by broader and shorter, firmer, more hairy, and wavy-toothed leaves, some of the main veins tending to the sinuses. COPPER BEECH is a variety with crimson-purple foliage.

4. **CÓRYLUS,** HAZEL-NUT, FILBERT. (Classical Latin name.) Shrubs, with flowers in early spring, preceding the rounded-heart-shaped, doubly-serrate, at first downy leaves. Edible nuts ripe in autumn.

C. **Avellàna,** EUROPEAN H. or FILBERT. Occasionally planted: 6°–10° high, with bristly shoots, and smoothish deeply-cleft involucre about the length of the (1′ long) oval nut.

C. **Americàna,** AMERICAN H. Thickets: 4°–6° high, with more downy shoots, leaves, and involucre, the latter open down to the smaller globular nut in the form of a pair of broad cut-toothed leafy bracts.

C. **rostràta,** BEAKED H. Thickets and banks, mostly N.: 2°–5° high, with more ovate and scarcely heart-shaped leaves, the densely bristly involucre prolonged in a narrow curved tube much beyond the ovoid nut.

5. **ÓSTRYA,** HOP-HORNBEAM. (Classical name.) Slender trees, with very hard wood: flowers appearing with the (Birch-like) leaves, in spring.

O. **Virgínica,** AMERICAN H., IRON-WOOD or LEVER-WOOD. Rich woods: tree 30°–50° high, with brownish rough bark, and oblong-ovate taper-pointed sharply doubly serrate leaves downy beneath, the sacs of the fruit bristly at base.

6. **CARPÌNUS,** HORNBEAM, IRON-WOOD. (Ancient Latin name.) Low trees or tall shrubs, with furrowed trunks and very hard wood, the close gray bark and small leaves resembling those of the Beech; flowers with the leaves, in spring.

C. **Americàna,** AMERICAN H., also called BLUE or WATER BEECH. Banks of streams: 10°–20° high; with ovate-oblong pointed doubly serrate leaves, becoming smooth, and halberd-3-lobed bracts of the involucre.

107. MYRICACEÆ, SWEET-GALE FAMILY.

Shrubs, with resinous-dotted often fragrant simple leaves, and monœcious or diœcious flowers, both kinds in short scaly catkins or heads, and destitute of any proper calyx, the 1-seeded fruit a fleshy little drupe or at length dry nut, commonly coated with wax.

1. MYRICA. Flowers mostly diœcious, the catkins from lateral scaly buds: each flower under a scale-like bract and with a pair of bractlets; the sterile of 2–8 stamens; the fertile of an ovary bearing 2 slender stigmas and surrounded by a few little scales.
2. COMPTONIA. Flowers mostly monœcious, the sterile in cylindrical catkins; the fertile in globular bur-like heads. Ovary surrounded by long awl-shaped scales which persist around the smooth little nut.

1. **MYRÌCA,** BAYBERRY, SWEET GALE. (Ancient name of some aromatic shrub.) Fl. spring, with or earlier than the leaves.

M. Gàle, SWEET GALE. Cold bogs N.: 1°–4° high, with pale wedge-lanceolate leaves, serrate towards the apex; little nuts crowded, and as if winged by a pair of scales.

M. cerífera, BAYBERRY, WAX-MYRTLE. Along the coast: shrub 2°–8° high, with fragrant lance-oblong or lanceolate mostly entire leaves, becoming glossy above, the scattered bony nuts thickly incrusted with greenish or white wax and appearing like berries.

2. **COMPTÒNIA,** SWEET-FERN. (Named for *Henry Compton*, a bishop of London.) Flowers rather later than the leaves, in spring.

C. asplenifòlia, the only species, in sterile rocky soil, chiefly E.: 1°–2° high, with linear-lanceolate downy leaves pinnatifid into many short and rounded lobes, resembling a Fern, and sweet-aromatic.

108. BETULACEÆ, BIRCH FAMILY.

Trees or shrubs, often resinous-sprinkled and aromatic, with alternate, simple, mostly straight-veined leaves, commonly deciduous stipules, and monœcious flowers, both kinds in scaly catkins, and 2 or 3 under each bract. Ovary 2-celled and 2-ovuled, but the fruit (a little nut or akene often surrounded by a wing like a samara) 1-celled and 1-seeded. Stigmas 2, thread-like.

1. BETULA. Sterile catkins long and hanging: 3 flowers under each shield-shaped scaly bract, each with a scale bearing 4 short stamens with 1-celled anthers. Fertile catkins stout: 2 or 3 flowers under each 3-lobed bract, each of a naked ovary ripening into a rounded broadly winged scale-like little key-fruit, tipped with the 2 stigmas.
2. ALNUS. Flowers much as in Betula: but usually a distinct 3–5-parted calyx; anthers 2-celled; oval fertile catkins composed of thick and at length woody persistent scales; and the little nutlets less winged or wingless.

1. **BÉTULA,** BIRCH. (The ancient Latin name.) Trees with slender spray (or a few low shrubs), more or less spicy-aromatic twigs, sessile scaly buds, flowers in early spring along with the leaves; the sterile catkins golden yellow; the fertile ones mostly terminating very short 2-leaved branches of the season. The following are all native trees.

* *Trunk with brown or yellow-gray bark, the inner and the twigs and thin straight-veined leaves spicy-aromatic: petioles short: thick fruiting catkins with their thin scales rather persistent: fruit with narrow wing.*

B. lénta, SWEET, BLACK, or CHERRY BIRCH. Moist woods mostly N.: a rather large tree, with fine-grained valuable wood, dark brown close bark on the trunk (not peeling in thin layers) and bronze-reddish twigs, very aromatic; leaves oblong-ovate and somewhat heart-shaped, sharply doubly serrate all round, soon glossy above and almost smooth; fruiting catkins oblong-cylindrical.

B. lùtea, YELLOW or GRAY B. With the other and more northward: less aromatic; bark of trunk yellowish-gray and somewhat silvery, separating in filmy layers; leaves duller, more downy, and rarely at all heart-shaped; fruiting catkins short-oblong.

* * *Trunk with chalky-white bark peeling horizontally in thin sheets: leaves and narrow cylindrical smooth catkins slender-stalked: bracts falling with the broad-winged fruit.*

B. álba, var. **populifòlia,** AMERICAN WHITE BIRCH. Small tree in low or sterile soil, from Penn. N. E., 15°–25° high, with triangular very taper-pointed smooth and glossy leaves.

B. papyràcea, PAPER or CANOE BIRCH. Large tree, from upper part of Penn. N., mostly far N.; with more ovate and even heart-shaped leaves (dull

beneath, and even dark green above), and more papery bark than in White Birch, separating in ample sheets.

**** Trunk with greenish-brown bark, hardly peeling in layers, reddish twigs little aromatic, and oblong downy short-stalked catkins: wings of fruit broad.*

B. nigra, River or Red Birch. Middle-sized tree of low river-banks, commonest S.: leaves rhombic-ovate, whitish and mostly downy beneath.

2. ÁLNUS, ALDER. (Ancient Latin name.) Small trees or shrubs, with narrow leaf-buds of very few scales and often stalked, and catkins mostly clustered or racemed on leafless branchlets or peduncles.

§ 1. *Flowers with the leaves in spring, the sterile from catkins which were naked over winter, while the fertile catkin was enclosed in a scaly bud.*

A. víridis, Green or Mountain Alder. Only rather far N., and on mountains: 3° – 8° high; leaves round-oval or ovate, glutinous; fruit with a broad thin wing.

§ 2. *Flowers in earliest spring, much before the leaves, both sorts from catkins which have remained naked over winter: wing of fruit narrow and thickish.*

A. serrulàta, Smooth A. Common, especially S.: 6° – 12° high, with obovate smooth or smoothish leaves green both sides and sharply serrate.

A. incàna, Speckled or Hoary A. Common N. along streams: 8° – 20° high; with broadly oval or ovate leaves rounded at base, serrate and often coarsely toothed, whitened and commonly downy beneath.

109. SALICACEÆ, WILLOW FAMILY.

Trees or shrubs, with bitter bark, soft light wood, alternate undivided leaves, either persistent or deciduous stipules, and diœcious flowers; both kinds in catkins, one flower under each bract or scale, the staminate of naked stamens only; the fertile of a 1-celled ovary which becomes a 2-valved pod with 2 parietal or basal placentæ, bearing numerous seeds furnished with a tuft of long cottony down at one end.

1. SALIX. Scales of the catkins entire. Sterile flowers of few or rarely many stamens, accompanied by 1 or 2 little glands. Fertile flowers with a little gland at the base of the ovary on the inner side: stigmas 2, short, each sometimes 2-lobed. Shrubs or trees with lithe branches, mostly 1-scaled buds, and narrow leaves.
2. POPULUS. Scales of the catkins cut or cleft at the apex. Flowers on a cup-shaped oblique disk. Stamens usually numerous. Stigmas long. Catkins drooping; flowers preceding the leaves, these mostly broad. Buds scaly.

1. SÀLIX, WILLOW, OSIER. (The classical Latin name.) The Willows, especially the numerous wild ones, are much too difficult for the beginner to undertake. For their study the Manual must be used. The following are the common ones planted from the Old World, with some of the most tree-like wild ones.

§ 1. *Stamens 2, but their filaments and often the anthers also united into one.*

S. purpùrea, of Eu.: known by the reddish or olive-colored twigs, lateral catkins before the leaves and with dark scales, red anthers, and sessile downy ovary.

§ 2. *Stamens 2 and separate.*

** Flowers earlier than the leaves: catkins sessile along the shoot of preceding year.*

S. viminàlis, Basket W. or Osier, of Eu., the twigs best for basket-work; has lance-linear entire slender-pointed leaves 3′ – 6′ long and satiny-white underneath.

* * *Flowers slightly earlier than the leaves but rather late in spring, on lateral catkins which have 4 or 5 leafy bracts at their base.*

S. cordàta. A common wild species along streams, badly named, as the leaves are seldom heart-shaped at base and generally lanceolate, often tapering to both ends, sharply serrate, smooth, pale or whitish beneath; stipules on young shoots conspicuous, ovate or kidney-shaped; ovary slender-stalked, tapering, smooth.

* * * *Flowers in loose catkins terminating leafy lateral shoots of the season, therefore later than the leaves, in late spring or early summer.*

S. longifòlia, LONG-LEAVED W. Wild on river-banks N.: low shrub or low tree, with very long lance-linear nearly sessile sparsely denticulate leaves grayish-hairy when young; catkins with narrow yellowish scales; the stalked silky-downy ovary bearing large stigmas.

S. Babylónica, WEEPING W. Planted from the Orient: a familiar tree, with very slender drooping branches, and linear-lanceolate leaves white beneath; in the monstrous variety called ANNULÀRIS, HOOP W., curved into a ring.

S. álba, WHITE W., commonly the var. VITELLÌNA, with yellow twigs: planted from Eu.; a familiar tree; leaves lanceolate, serrate, white-silky underneath; stipules lanceolate; ovary nearly sessile and smooth.

S. frágilis, BRITTLE W., from Eu. (so called because the twigs, used for basket-work, &c., break off readily from their base, as in several other species); large tree, with lanceolate taper-pointed leaves white but smooth beneath, half heart-shaped stipules, and nearly sessile smooth ovary.

§ 3. *Stamens 3 – 5 or more, separate: catkins late-flowering, terminating leafy branches of the season as in the preceding species: stamens hairy: ovary smooth: scales deciduous: leaves serrate, smooth.*

S. nigra, BLACK W. Low river-banks: wild tree, with rough black bark, narrow-lanceolate taper-pointed leaves, 3 – 6 stamens, and short-ovate pods.

S. pentándra, BAY W. A handsome tree, planted from Eu. for the deep green very glossy lanceolate taper-pointed leaves, of the same hue both sides, the large staminate catkins of golden yellow flowers also handsome: stamens 4 – 12, commonly 5; pods tapering.

S. lùcida, AMERICAN BAY W. Wild in wet ground N.: very like the last, but a shrub, with shorter catkins on a less leafy short branch.

2. PÓPULUS, POPLAR, ASPEN. (Classical Latin name.) Fl. spring.

§ 1. *Buds not glutinous: leaves cottony, at least beneath, even when old.*

P. álba, ABELE or WHITE P. Tree planted from Eu., with spreading branches, roundish slightly heart-shaped wavy-toothed or lobed leaves soon green above, very white-cottony beneath: spreads inveterately by the root.

§ 2. *Buds not glutinous: leaves cottony when developed, but soon smooth and green both sides: bark smooth and close, greenish-white.*

P. tremuloìdes, AMERICAN ASPEN. Small tree, common in woods N.; with small roundish-heart-shaped leaves beset with small regular teeth; scales of the catkin cut into 3 or 4 linear lobes, fringed with long hairs.

P. grandidentàta, LARGER AMERICAN ASPEN. Middle-sized tree, common in woods: the larger roundish-ovate leaves with coarse and irregular blunt teeth; scales unequally 5 - 6-cleft, slightly fringed.

P. heterophýlla, DOWNY POPLAR. Wet grounds, common only W. & S.: tree 40° – 60° high; leaves round-ovate or heart-shaped with the sinus closed by the overlapping lobes, obtuse, serrate with incurved teeth, 3′ – 5′ long, white wool deciduous only with age, leaving traces on the veins beneath and on the petioles; fruiting catkins smooth.

§ 3. *Buds glutinous with aromatic resin or balsam: leaves smooth from the first,*

P. dilatàta, LOMBARDY P. Stiff spiry tree, with closely appressed branches, and small broadly triangular pointed leaves, formerly much planted, from the Old World, — thought to be a remarkable state of

P. nigra, Black P., of Eu., which is occasionally planted, and has spreading branches, larger leaves, more glutinous buds, &c.

P. monilifera, Cotton-wood or Necklace P. Along the Great Lakes and rivers, from L. Champlain W. and S. W.: large tree, with young branches somewhat *angled; leaves dilated-triangular or slightly heart-shaped*, taper-pointed, serrate with cartilaginous incurved teeth and prominent lateral veins; fertile catkins very long and interrupted, their scales cut-fringed; stigmas very large, toothed.

P. balsamífera, Balsam P. or Tacamahac. Middle-sized tree, wild along our Northern borders and N. W.: has round or scarcely angled branchlets, very glutinous and pleasantly balsamic strong-scented bud-scales, and ovate or lance-ovate gradually tapering leaves.

Var. **cándicans**, Balm-of-Gilead P.: planted around dwellings as a shade tree, wild in some places, spreading inveterately from the root; appears to be a variety of the Balsam Poplar, with broader ovate and often heart shaped leaves lighter-colored beneath.

Subclass II. GYMNOSPERMOUS: no closed ovary, style, or stigma, but ovules and seeds naked on a scale or some other sort *of transformed leaf, or in Yew at the end of a scaly-bracted stalk*; the mouth of the ovule receiving the pollen directly. (Lessons, p. 121, fig. 264 – 266; p. 133, fig. 312 – 314.) Leaves not netted-veined.

Cýcas revolùta (Lessons, p. 19, fig. 47), from the southern part of Japan, a palm-like low tree of conservatories, wrongly called Sago Palm, and

Zàmia integrifòlia, the Coontie *of Florida, the root-like trunk of* which does not rise above ground, and furnishes a kind of flour called Florida Arrow-root, represent the order Cycadaceæ.

111. CONIFERÆ, PINE FAMILY.*

Trees or shrubs, with wood of homogeneous fibre (no ducts), resinous juice, commonly needle-shaped or awl-shaped leaves, and monœcious or sometimes diœcious flowers destitute of both calyx and corolla, and in catkins or the like. (See Lessons, as above.)

I. PINE FAMILY proper. These are true *Coniferæ*, or cone-bearing trees, the fertile flowers being in a scaly catkin which becomes a strobile or scaly cone. The scales are each in the axil of a bract (which is sometimes evident and projecting, but often concealed in the full-grown cone), and bear a pair of ovules adhering to their inner face next the base, the orifice downwards, and the two winged seeds peel off the scale as the latter expands at maturity. They all have scaly buds. All the common and hardy trees of the family belong to the following.

1. PINUS. Leaves persistent, long and needle-shaped, 2, 3, or 5 in a cluster from the axil of dry bud-scales, developed after the scaly shoot of the season lengthens. Sterile catkins clustered at the base of the shoot of the season: each stamen answers to a flower, reduced to a 2-celled anther, with hardly any filament. Cone woody, mostly large, maturing in the autumn of the second year. Cotyledons of the embryo several. (See Lessons, p. 18, fig. 45, 46; p. 72, fig. 140; p. 133, 144, fig. 312 – 314.)

* For a particular account of the numerous trees of this noble family now planted or beginning to be planted for ornament special works should be consulted, such, especially, as the recent "Book of Evergreens" by Mr. Hoopes. We give here only the principal species of the country, east of the Mississippi, and the *well-established* introduced species, mainly such as are fully hardy North.

2. ABIES. Leaves persistent, linear or short needle-shaped, borne directly on the shoots of the season, over which they are thickly and uniformly scattered. Sterile catkins in the axils of the leaves of the preceding year. Fertile catkins solitary, maturing in the autumn of the same year; their scales thin and even, never prickle-bearing.
3. LARIX. Leaves all deciduous in autumn, soft, short needle-shaped, in spring developed very many in a dense cluster from axillary buds of the previous summer (Lessons, p. 71, fig. 139), those on shoots of the season similar but scattered. Cones as in Abies, the scales persistent.
4. CEDRUS. Leaves as in Larix, but rigid and persistent. Cones globular, large, of very broad thin scales, which at length fall away from the axis.

II. CYPRESS FAMILY. These have both kinds of flowers in short often globular catkins of few scales; the fertile making a globular or ovate small cone, which is often fleshy when young, sometimes imitating a berry. The branches appear and the shoots grow on without the intervention of any scaly buds. Leaves often opposite or whorled, sometimes scale-like and adnate to the branch.

§ 1. *Scales of the globular cone with a pointed bract behind each wedge-shaped scale, party cohering with its back.*

5. CRYPTOMERIA. Cone terminating a leafy branch, the recurved tip of the bract and awl-shaped lobes of the top of the scales projecting.

§ 2. *Scales of the fruit simple, no bract behind them.*

* *Fruit a sort of cone, dry and hard when mature: flowers monœcious, rarely diœcious.*

+ *Leaves thin and delicate, flat, deciduous.*

6. TAXODIUM. Two kinds of flowers on the same branches; the sterile catkin spike-panicled, of few stamens; the fertile in small clusters. Cone globular, firmly closed till mature, of several very thick-topped and angular shield-shaped scales, a pair of erect 3-angled seeds on their stalk.

+ + *Leaves evergreen, linear and awl-shaped, alternate, free, destitute of glands.*

7. SEQUOIA. Catkins globular, the scales of the fertile ones bearing several ovules. Cone woody; the shield-shaped scales closed without overlapping, and bearing 3–5 flat wing-margined seeds hanging from the upper part of their stalk-like base.

+ + + *Leaves evergreen, opposite, awl-shaped and scale-shaped (the former on the more vigorous lengthening shoots, the latter closely imbricated and decussate on the succeeding branchlets), commonly with a resinous gland on the back. Seeds and ovules erect: cotyledons only 2 or 3.*

8. CUPRESSUS. Cones spherical; the shield-shaped scales closing by their well-fitted margins, not overlapping, separating at maturity, each scale bearing two or usually several ovules and winged or wing-margined seeds, its broad summit with a central boss or short point.
9. THUJA. Cones oblong or globular, the scales not shield-shaped but concave and fixed by their base, overlapping in pairs, pointed if at all from or near their summit, spreading open at maturity, each bearing a single pair of ovules and seeds, or rarely more.

* * *Fruit berry-like: flowers commonly diœcious.*

10. JUNIPERUS. Catkins very small, lateral; the fertile of 3–6 fleshy scales growing together, and ripening into a sort of globular berry, containing 1–3 bony seeds. Leaves evergreen, opposite or whorled.

III. YEW FAMILY. Distinguished by having the fertile catkin, if it may be so called, reduced to a single terminal flower, consisting of an ovule only, surrounded by some bracts, ripening into a nut-like or drupe-like seed: cotyledons only 2. There is nothing answering to the scales of a pine-cone. Leaf-buds scaly as in the true Pine Family. Flowers mostly diœcious, axillary.

11. TAXUS. Leaves linear, appearing more or less 2-ranked, green both sides. Both kinds of catkins, if such they may be called, are small axillary buds

imbricated with persistent scales, bearing at the apex, one a few naked stamens, each with 3–8 anther-cells under a somewhat shield-shaped apex, the other an ovate ovule. This in fruit becomes a nut-like blackish seed, resting in the bottom of a berry-like red cup.

12. TORREYA. Leaves, catkins, &c., nearly as in Taxus. Stamens more scale-shaped at top, each bearing 4 hanging anther-cells. Naked seed resembling a thin fleshed drupe or when dry a nut, with no cup around it, as large as a nutmeg, which it resembles also in the brain-like interior structure.

13. SALISBURIA. Leaves wedge-shaped and fan-shaped, deeply 2-cleft and the lobes wavy-toothed and somewhat cleft at the broad truncate end, traversed with straight simple or forking nerves or veins, like a Fern. Flowers not often seen. Sterile catkins slender and loose. Seed drupe-like, and with a fleshy short cup around its base.

PODOCARPUS, one or two species in choice conservatories, and two half hardy in the Middle States as low shrubs, — the genus so called because the fleshy seed is raised on a sort of stalk, — belongs here. The leaves are sometimes much unlike those of other Coniferous trees, being large, linear, lanceolate, or even ovate, and veinless, except the midrib.

1. PÌNUS, PINE. (The classical Latin name.) Flowers in late spring.

§ 1. PITCH-PINES *and their relatives, with leaves only 2 or 3 in the cluster, scaly-sheathed at the base: wood resinous.*

* *Cones lateral and persistent on the branch long after shedding the seed, the scales thickened at the end, often tipped with a cusp or spine: leaves rigid.*

+ *Leaves 3 in the cluster. All natives, but the last Californian.*

P. austràlis, LONG-LEAVED or SOUTHERN YELLOW PINE. Lofty striking tree, of pine-barrens from N. Car. S.; with leaves 10′–15′ long, very resinous wood, and cones 6′–10′ long, the scales tipped with a reflexed short spine.

P. tæda, LOBLOLLY or OLD-FIELD P. Smaller tree, in light soil, from Virginia S., with less resinous wood, dark green leaves 6′–10′ long, and solitary cones 3′–5′ long, the scales tipped with a short straight or incurved spine.

P. rígida, NORTHERN PITCH P. Sandy or thin rocky soil, abounding along the coast N. and in the upper country S.: a stout tree, with dark green leaves 3′–5′ long from short sheaths, clustered ovate-conical cones 2′–3′ long, the scales tipped with a recurved spine or prickle.

P. serótina, POND P. Small tree in wet ground from N. Car. S.; with valueless wood, leaves 4′–8′ long, and mostly opposite round-ovate cones 2′–3′ long, their scales tipped with a very small and weak prickle.

P. ponderòsa (or BENTHAMIÀNA); planted from California, where it is a characteristic tree, with heavy wood, deep green leaves 6′–11′ long, and clustered cones about 3′ long, reflexed on a short stalk.

+ + *Leaves only 2 in the sheath, or a few of them sometimes in threes.*

++ *Planted from Europe.*

P. sylvéstris, SCOTCH PINE (wrongly called also *Scotch Fir*), the common Pine of N. Europe: middle-sized tree, known by the bluish-white hue of its flat leaves (2′–4′ long), reddish bark on the trunk, and narrow tapering cones, the scales with tubercle-like tips.

P. Austriaca, AUSTRIAN P., a probable variety of P. LARÍCIO, or CORSICAN P. of S. Eu.: a fast-growing massive tree, with very rough branches, dark-green slender but rigid leaves 4′–6′ long, and conical cones 2½′–3′ long.

++ ++ *Wild species of the country.*

P. púngens, TABLE-MOUNTAIN or PRICKLY PINE. Along the Alleghanies from Penn. to S. Car.: middle-sized tree; with dark bluish-green leaves only about 2′ long; but the heavy and clustered cones fully 3′ long, ovate, and the scales armed with a very strong somewhat hooked spine.

P. mitis, YELLOW PINE of the North, SHORT-LEAVED YELLOW PINE S.: a middle-sized tree in sandy or dry soil, with firm fine-grained wood, slender leaves (not rarely in threes) 3′–5′ long, and mostly solitary ovate or oblong-onical cones barely 2′ long, the scales tipped with a minute weak prickle.

P. inops, JERSEY SCRUB P. Low straggling tree of barrens and sterile hills, from New Jersey S. & W.; with drooping branchlets, leaves 1′–3′ long, and solitary ovate-oblong cones 2′ long, reflexed on a short stalk, the scales tipped with an awl-shaped prickle.

P. Banksiàna, GRAY or NORTHERN SCRUB P. Along our northern frontiers and extending N., on rocky banks: straggling shrub or tree, 5°–20° high; with oblique or contorted leaves 1′ long, curved cones barely 2′ long, and blunt scales.

* * *Cones at the apex of the branch and falling after shedding the seed, their scales slightly thickened at the end and without any prickly point; leaves only 2 in the cluster and with a long sheath, slender.*

P. resinòsa, RED PINE, and wrongly called NORWAY PINE: the Latin name not a good one, as the tree is not especially resinous: dry woods N. from N. England to Wisconsin; 50°–80° high, with reddish and smoothish bark, compact wood, dark green leaves 5′–6′ long and not rigid, and ovate-conical smooth cones about 2′ long.

§ 2. WHITE PINES, *with softer leaves, 5 in the cluster, their sheath and the scale underneath early deciduous: cones long, cylindrical, terminal, hanging, falling after shedding the seeds, their scales hardly if at all thickened at the end, pointless: seed thin-shelled and winged.*

P. Stróbus, WHITE PINE. Tall tree in low or fertile soil N. and along the mountains; with soft white wood invaluable for lumber, smooth greenish bark on young trunks and branches, pale or glaucous slender leaves 3′–4′ long, and narrow cones 5′–6′ long.

P. excélsa, BHOTAN or HIMALAYAN WHITE P. Ornamental tree barely hardy for N.; with the drooping and white leaves and the cones nearly twice the length of those of White Pine.

P. Lambertiàna, LAMBERT'S or SUGAR P. One of the tallest trees of Oregon and California, beginning to be planted: has leaves as rigid as in many Pitch Pines, 3′–5′ long, bright green, the cones also at first erect, when full grown 12′–20′ long.

§ 3. NUT PINES, *with leaves, &c. as in the preceding section, but short thick cones of fewer and thick pointless scales, and large hard-shelled edible seeds destitute of a wing.*

P. Cémbra, CEMBRA or SWISS STONE P. of the higher Alps: small, slow-growing, very hardy ornamental tree, with green 4-sided leaves 3′–4′ long and much crowded on the erect branches; cones round-oval, erect, 2′ long, the round seeds as large as peas.

2. ABIES, SPRUCE, FIR (Classical Latin name.—The names ABIES and PICEA, for Spruce and Fir, are just oppositely used by different authors. Linnæus employed the former for Spruce, the latter for Fir, and so do some late writers. The ancients used the names just the other way, and the later botanists mostly follow them.) Fl. late spring.

§ 1. SPRUCE. *Cones hanging or nodding on the end of a branch, their scales persistent: cells of the anther opening lengthwise: the needle-shaped and 4-sided leaves pointing every way.*

A. excélsa, NORWAY SPRUCE: the most common and most vigorous species planted, from Europe; fine large tree, with stout branches, deep green leaves larger than in the next, the mature hanging cones 5′–7′ long.

A. nigra, BLACK or DOUBLE SPRUCE. Cold woods and swamps N. and along the mountains S.: middle-sized tree, with leaves (seldom over ½′ long) dark green, and a glaucous-whitish variety E.; its ovate cones recurving on short branches, 1′–1½′ long, persistent for several years, thin rigid scales with thin often eroded edge.

A. álba, WHITE SPRUCE. Wild only along our northern borders and N.; when planted a very handsome tree, with pale glaucous leaves; cylindrical nodding cones about 2′ long, falling the first winter, the thinner scales with a firm even edge.

A. Menzièsii, MENZIES' SPRUCE, of the Rocky Mountains and W., is planted and likely to become common: fine tree, with broader and stiffer leaves than the foregoing, almost prickly-pointed, silvery-whitish beneath; cones about 3′ long, cylindrical, soft, their scales rhombic-ovate, thin and pale.

§ 2. HEMLOCK-SPRUCE (TSUGA). *Cones hanging on declined branches of the preceding year, small, persistent, and their scales persistent: sterile catkins very small and globular, of a few anthers which open across: leaves flat, on distinct little petioles, most of them spreading right and left so as to appear 2-ranked on the branch.*

A. Canadénsis, HEMLOCK-SPRUCE. Common on hills N., and planted for ornament: large tree, with coarse wood, light and spreading spray, broadish-linear and blunt leaves only ½′ long, green above and white beneath, and oval cones only ½′ or ¾′ long, their bracts very short and hidden.

A. Douglásii, DOUGLAS SPRUCE, one of the tall trees from Rocky Mountains and W. to the Pacific, planted but proves not quite hardy enough N., is of this section: it has slender leaves 1′ or more long, light green, indistinctly 2-ranked; cones 2′–3′ long, loose, with pointed and toothed bracts projecting beyond the scales.

§ 3. FIR. *Cones set rigidly erect on the upper side of spreading branches of the preceding year, their scales and commonly conspicuous bracts falling away with the seeds when ripe from the persistent slender axis: seeds resinous: anthers irregularly bursting: leaves flat, white beneath each side of the prominent midrib, those on horizontal branches inclined to spread right and left so as to appear 2-ranked.*

* BALSAM FIRS, *native trees: bark yielding Canada balsam from blisters, &c.*

A. balsàmea, COMMON B. Small tree of cold or wet grounds N., handsome when young, but short-lived, with worthless wood, narrow linear leaves ⅝′ or less than 1′ long and much crowded, cylindrical violet-colored cones 2′–4′ long and 1′ thick, their bracts with only the abrupt slender point projecting.

A. Fràseri, FRASER'S or SOUTHERN B. Along the higher Alleghanies: small tree, like the preceding; but the small cones (only 1′–2′ long) oblong-ovate, with the short-pointed upper part of the bracts conspicuously projecting and reflexed.

* * SILVER-FIRS, &c., *very choice ornamental trees, only the first at all common.*
+– *Leaves blunt.*

A. pectinàta, EUROPEAN SILVER-F. Large tree with wood, its horizontal branches with narrow leaves (greener above than in Balsam F., nearly as white beneath, and 1¼′ long) forming a flat spray; cones 6′–8′ long, with slender projecting points to the bracts

A. Nordmanniàna, from the Crimea and N. Asia; with thicker-set and broader leaves than the foregoing, linear, curved, 1′ long, deep green above and whitened beneath; cones large and ovate.

A. Pìchta, SIBERIAN SILVER-F.; with thicker-set leaves than those of European Silver-Fir, dark green above and less white beneath; cones only 3′ long, their short bracts concealed under the scales.

A. grándis, GREAT SILVER-FIR of Oregon and California: resembles a fine Balsam Fir on a large scale, with broader leaves notched at the end, about 1′ long, and thicker cones with concealed bracts.

+– *Leaves acute or pointed, especially on main shoots, rigid, widely and about equally spreading on all sides.*

A. Cephalónica, CEPHALONIAN SILVER-FIR: remarkable for its very stiff almost prickly-pointed squarrose leaves dark green above, white beneath.

A. Pinsàpo, SPANISH SILVER-FIR: resembles the last, but not so hardy, leaves less pointed, and the bracts of the cones are concealed.

3. LÀRIX, LARCH. (The ancient name.) Trees planted for ornament and valuable for timber: branches slender, the young ones pendulous: flowers in earliest spring, much before the leaves appear: catkins from later-

spurs or broad buds; the sterile globular, yellow; the fertile oval, crimson-red, being the color of the bracts.

L. Europæa, EUROPEAN LARCH, the one generally planted: a fine fast-growing tree, with leaves about 1′ long, and longer cones of numerous scales.

L. Americàna, AMERICAN L., TAMARACK or HACKMATACK. Swamps N.: slender tree with shorter and paler leaves, and small cones of few scales, only ½′ or ¾′ long.

4. CÈDRUS, CEDAR, i. e. of Lebanon. (Ancient Greek name.) Wood reddish, fragrant. Cult. for ornament, but precarious in this climate.

C. Líbani, CEDAR OF LEBANON; with dark foliage and stiff horizontal branches, the terminal shoot erect: not hardy E. of New York.

C. Deodàra, DEODAR C. of Himalayas; with lighter drooping spray on young trees, and whitish foliage: seems unlikely to flourish in this country.

5. CRYPTOMÈRIA. (Name, from the Greek, means *concealed parts* or *joints.*) Evergreen tree from Japan.

C. Japónica, not hardy N. but often in conservatories; leaves crowded, awl-shaped, many-ranked, edgewise and decurrent on the stem.

6. TAXÒDIUM, BALD-CYPRESS. (Name, from the Greek, means *Yew-like:* the resemblance is only in the shape of the leaves.) Fl. before the leaves, in earliest spring.

T distichum, AMERICAN B. or SOUTHERN CYPRESS. Large tree in swamps S., and planted, even N.: branchlets slender, many of them falling in autumn like leafstalks; leaves light green, ½′ long, narrow-linear, 2-ranked, on some flower-bearing shoots awl-shaped and imbricated; cones 1′ or less thick.

7. SEQUÒIA, REDWOOD. (Named for the Cherokee half-breed Indian *See-qua-yah,* who invented an alphabet for his nation.) Very celebrated, gigantic, Californian trees, with fibrous bark, not unlike that of Taxodium, and soft, fissile, dull-red wood. Neither species is hardy in New England, or safe in the Middle States; but the second is disposed to stand.

S. sempérvirens, Common Redwood of the coast ranges of California; with flat and linear acute leaves 2-ranked on the branches, but small awl-shaped and scattered ones on the erect or leading shoots, and small globular cones (barely 1′ long).

S. gigantèa, GIANT REDWOOD (in England called WELLINGTONIA) of the Sierra Nevada; with all the leaves awl-shaped and distributed round the branch; cones ovoid, 1½′ – 2′ long.

8. CUPRÉSSUS, CYPRESS. Classical name of the Oriental Cypress, namely,

C. sempérvirens, planted only far S.; stiff narrow tree, with slender erect branchlets, dark foliage, and cone 1′ in diameter, each scale many-seeded.

C. thujoides, WHITE CEDAR. Tree of low grounds S. & E., with white valuable wood, slender spray, and pale glaucous-green triangular-awl-shaped leaves much finer than in Arbor Vitæ; cones hardly ½′ wide, with few seeds to each scale, and these almost wingless.

C. Lawsoniàna, of N. California, recently much planted, and if fully hardy promising to be very ornamental; has thickly set and plume-like flat spray, of bluish-green hue, and cones scarcely above ¼′ in thickness, their scales bearing 2 – 4 ovules and ripening 2 or 3 seeds.

C. pisífera, or RETINÓSPORA PISIFERA (of which C. OBTÙSA is seemingly a form with the scale-shaped leaves blunter and cone larger), is a scarcely hardy species, introduced from Japan, the cones only as large as peas (to which the specific name refers), a single pair of broad-winged seeds to each scale.

C. squarròsa, or ERICOIDES, from Japan, is perfectly hardy N., perhaps a variety of the last, but of strikingly different appearance, bearing only loose and awl-shaped leaves.

9. THÙJA, ARBOR VITÆ. (Ancient name of some resin-bearing evergreen.) The varieties planted in collections are very numerous; the following are the principal natural types, by many taken for genera.

T. occidentàlis, AMERICAN ARBOR VITÆ, or WHITE CEDAR of the North. Common tree N., in swamps and cool moist woods, much planted, especially for hedges and screens; leaves mostly of the scale-shaped sort, blunt and adnate; cones oblong, rather soft, the oblong scales pointless, and bearing 2 thin winged seeds. Many nursery varieties, some of which, especially var. ERICOÌDES or HEATH-LIKE A., have the loose awl-shaped sort of leaves.

T. orientàlis, or BIÒTA ORIENTALIS, the CHINESE A., not fully hardy far N.: small tree, with even the scale-shaped leaves acute, cone larger, with thicker scales *tipped with a recurving horn-like apex or appendage, each* 2-seeded, and the seeds hard-shelled and wingless. — Var. AÙREA, the GOLDEN A. is dwarf and very dense, with yellow-green or partly golden-tinged foliage. Var. TARTÁRICA, is a more hardy glossy-green variety, the leaves scale-shaped. Var. MELDÉNSIS, one with only loose and awl-shaped leaves. Even the slender-stemmed and weeping T. PÉNDULA is an extreme variety.

T. dolabràta, or THUJÓPSIS DOLABRATA of Japan. Remarkable for its very flat spray, broad and very blunt large leaves (sometimes ¼′ long) green above and white beneath; the cone with thick and rounded scales, each with 5 wing-margined seeds.

10. JUNÍPERUS, JUNIPER. (Classical Latin name.) Fl. late spring.

§ 1. *Leaves (scale-like and awl-shaped, small, the former sort minute and very adnate) like those of Cypress and Arbor Vitæ.*

J. Virginiàna, RED CEDAR or SAVIN. A familiar shrub and small or large tree, with most durable and valuable reddish odorous wood; the small fruit dark with a white bloom, erect on the short supporting branchlet.

J. Sabìna, var. **procúmbens.** Rocky banks, trailing over the ground along our northern borders, with the scale-shaped leaves less acute, and the fruit nodding on the short peduncle-like recurved branchlet.

§ 2. *Leaves all of one sort, in whorls of 3, jointed with the stem, linear with an awl-shaped prickly point, the midrib prominent, also the rib-like margins.*

J. commùnis, COMMON JUNIPER. Erect or spreading shrub; with very sharp-pointed leaves green below and white on the upper face; berries large and smooth. The wild, low, much *spreading variety is common* N. *in sterile or* rocky ground. Var. HIBÉRNICA, very erect tree-like shrub, forming a narrow column, is most planted for ornament, from Eu.

11. TÁXUS, YEW. (Classical name, from the Greek for a *bow*, the tough wood was chosen for bows.) Fl. early spring.

T. baccàta, EUROPEAN YEW. Low tree, with thick upright trunk, *spreading short branches, and* pointed dark green leaves *about* 1′ *long; when planted* in this country forms only a shrub.

Var. **fastigiàta,** IRISH YEW; a singular form, making a narrow column, the branches appressed; the leaves shorter, broader, and scarcely in two ranks.

Var. **Canadénsis,** AMERICAN YEW or GROUND HEMLOCK; shady cold banks and woods N.; the stems spreading over the ground.

12. TORRÈYA. (Named for our *Dr. John Torrey.*) Flowers in spring.

T. taxifólia. Woods in Florida: a handsome tree, but with the wood and foliage ill-scented; leaves like those of Yew but longer and tapering to a sharp point: hardy as a shrub as far north as New York. — T. CALIFÓRNICA, is the CALIFORNIAN NUTMEG-TREE. T. NUCÍFERA, from Japan, is another species.

13. SALISBÙRIA, GINKGO-TREE. (Named for *R. A. Salisbury.*)

S. adiantifòlia (the name denotes the likeness of the leaves to those of the Maidenhair Fern), a most singular tree, planted from Japan, hardy even N.; branches spreading; the fan-shaped alternate leaves with their slender stalks, 3′ or 4 long.

CLASS II. MONOCOTYLEDONOUS or ENDOGENOUS PLANTS: Distinguished by having the woody matter of the stem in distinct bundles scattered without obvious order throughout its whole breadth, never so arranged as all to come in a circle, when abundant enough to form proper wood as in Palms and the like, this is hardest and the bundles most crowded toward the circumference. Embryo with a single cotyledon; the first leaves in germination alternate. Leaves mostly, but not always, parallel-veined. Parts of the flower almost always in threes, never in fives. See Lessons, p. 117, and for style of vegetation, p. 19, fig. 47.

The plants of this class may be arranged under three generally well-marked divisions.

I. SPADICEOUS DIVISION. Flowers either naked, i. e. destitute of calyx and corolla, or these if present, not brightly colored, collected in the sort of spike called a spadix, which is embraced or subtended by the kind of developing bract termed a spathe. The most familiar examples of this division are offered by the Arum Family. To it also belong on one hand the Palms, on the other the Pondweeds — here merely mentioned, as follows: —

Sàbal Palmétto, CABBAGE PALMETTO, of the sandy coast from N. Carolina S., our only tree of the class, with

S. serrulàta, SAW PALMETTO, of the Southern coast, the trunk of which creeps on the ground, and the short petioles are spiny-margined, whence the popular name,

S. Adansònii, DWARF PALMETTO, the leaves of which, rising from a stem underground, are smooth-edged, and

Chamærops Hýstrix, BLUE PALMETTO of S. Carolina, &c., with erect or creeping trunks only 2° - 3° long, and pale or glaucous leaves 3° - 4° high; — these represent with us the PALM FAMILY.

Potamogèton nàtans, and other species of PONDWEED abound in ponds and streams, and represent the NAIADACEÆ or PONDWEED FAMILY, — plants of various forms but of little interest — in fresh water.

Zostèra marìna, GRASS-WRACK or EEL-GRASS of salt water, with its long ribbon-like bright green leaves, and flowers hidden in their upper sheaths, represents the same family in shallow bays of the ocean.

Lémna polyrhiza, DUCKWEED, consisting of little green grains, about $\frac{1}{8}' - \frac{1}{4}'$ long, floating on stagnant water, producing a tuft of hanging roots from their lower face, never here found in blossom,

L. minor, still smaller and with only a single root, — and the less common

L. trisùlca, which is oblong-lanceolate from a stalk-like base, — all propagating freely by budding from the side and separating, — are greatly simplified little plants representing the LEMNACEÆ or DUCKWEED FAMILY, their minute flower rarely seen. See Manual; also Structural Botany, p. 70, fig. 102.

112. ARACEÆ, ARUM FAMILY.

Plants with pungent or acrid watery juice, leaves mostly with veins reticulated so as to resemble those of the first class, flowers in the fleshy head or spike called a spadix, usually furnished with the colored or peculiar enveloping bract called a spathe.

There are several stove-plants of the family now rather common in choice collections, mostly species and varieties of CALADIUM, cultivated for their colored and variegated foliage.

§ 1. *Leaves with expanded blade, and with spreading nerves or veins, never linear.*

* *Flowers wholly destitute of calyx and corolla.*

1. ARISÆMA. Leaves compound, only one or two, with stalks sheathing the simple stem, which rises from a fleshy corm, and terminates in a long spadix bearing flowers only at its base, where it is enveloped by the convolute lower part of the greenish or purplish spathe. Sterile flowers above the fertile, each of a few sessile anthers; the fertile each a 1-celled 5–6-ovuled ovary, in fruit becoming a scarlet berry: commonly diœcious, the stamens being abortive in one plant, the pistils abortive in the other.
2. COLOCASIA. Leaves simple, peltate, and with a notch at the base. Spathe convolute, yellowish, much longer than the spadix: the latter covered with ovaries at base, above with some abortive rudiments, still higher crowded with numerous 6–8-celled sessile anthers, and the pointed summit naked.
3. PELTANDRA. Leaves arrow-shaped; these and the scape from a tufted fibrous root. Spathe convolute to the pointed apex, green, wavy-margined. Spadix long and tapering, covered completely with flowers, i. e. above with naked shield-shaped anthers each of 5 or 6 cells, opening by a hole at the top, below with one-celled ovaries bearing several erect ovules, in fruit a 1–3-seeded fleshy bag. Seeds obovate, surrounded by a tenacious jelly.
4. RICHARDIA. Leaves arrow-shaped; these and the long scape from a short tuberous rootstock. Spathe broad, spreading above, bright white, convolute at base around the slender cylindrical spadix, which is densely covered above with yellow anthers, below with ovaries, each incompletely 3-celled, and containing several hanging ovules.
5. CALLA. Leaves heart-shaped, on long petioles; these and the peduncles from a creeping rootstock. Spathe open, the upper face bright white, spreading widely at the base of the oblong spadix, which is wholly covered with flowers; the lower ones perfect, having 6 stamens around a 1-celled ovary; the upper often of stamens only. Berries red, containing a few oblong seeds, surrounded with jelly.

* * *Flowers with a perianth, perfect, covering the whole spadix.*

6. SYMPLOCARPUS. Leaves ovate, very large and veiny, short-petioled, appearing much later than the flowers from a fibrous-rooted corm or short rootstock. Spathe shell-shaped, ovate, incurved, thick, barely raised out of ground, enclosing the globular spadix, in which the flowers are as it were nearly immersed. Each flower has 4 hooded sepals, 4 stamens with 2-celled anthers turned outwards, and a 1-celled 1-ovuled ovary tipped with a short awl-shaped style: the fruit is the enlarged spongy spadix under the rough surface of which are imbedded large fleshy seeds.

§ 2. *Leaves linear, flag-like, nerved: spadix appearing lateral.*

7. ACORUS. Spadix cylindrical, naked, emerging from the side of a 2-edged simple scape resembling the leaves, densely covered with perfect flowers. Sepals 6, concave. Stamens 6, with linear filaments and kidney-shaped anthers. Ovary 2–3-celled, with several hanging ovules in each cell, becoming dry in fruit, ripening only one or two small seeds.

ARISÆMA, INDIAN TURNIP, &c. (Name altered from *Arum*, to which these plants were formerly referred.) Wild plants of rich woods, fl. in spring, veiny-leaved, their turnip-shaped corm farinaceous, but imbued with an intensely pungent juice, which is dissipated in drying. ♃

A. triphýllum, COMMON INDIAN TURNIP. In rich woods; leaves mostly 2, each of 3 oblong pointed leaflets; stalks and spathe either green or variegated with whitish and dark-purple stripes or spots, the latter with broad or flat summit incurved over the top of the club-shaped and blunt spadix.

A. Dracóntium, Dragon-Arum, Dragon-root, or Green Dragon. Low grounds; leaf mostly solitary, its petiole 1° – 2° long, bearing 7 – 11 pedate lance-oblong pointed leaflets; the greenish spathe wholly rolled into a tube with a short slender point, very much shorter than the long and tapering tail-like spathe.

2. COLOCÀSIA. (The ancient Greek name of the common species.) ♃

C. antiquòrum, one variety called C. esculénta; cult. in the hot parts of the world for its farinaceous thick rootstocks (which are esculent when the acrid principle is driven off by heat, as also the leaves), and in gardens for its magnificent foliage, the pale ovate-arrow-shaped leaves being 2° – 3° long when well grown; the stalk attached much below the middle, the notch not deep.

3. PELTÁNDRA, ARROW-ARUM. (Name of Greek words meaning *shield-shaped stamen*, from the form of the anthers.) Fl. summer. ♃

P. Virgínica. Shallow water: 1° – 2° high; leaves pale; the fine transverse nerves running from the midrib and netted with 2 or 3 longitudinal ones near the margin; scapes recurved in fruit; top of the spathe and spadix rotting off, leaving the short fleshy base firmly embracing the globular cluster of green berries.

4. RICHÁRDIA. (Named for the French botanist, *L. C. Richard.*) ♃

R. Africàna, the Æthiopian or Egyptian Calla, of common house-culture, but a native of the Cape of Good Hope and not a true Calla, — too familiar to need fuller description.

5. CÁLLA, WATER ARUM. (An ancient name.) Fl. early summer. ♃

C. palústris. Cold and wet bogs from Penn. N.: a low and small, rather handsome plant; leaves 3′ – 4′ long; filaments slender; anthers 2-celled.

6. SYMPLOCÁRPUS, SKUNK CABBAGE. (Name of Greek words for *fruit grown together*.) ♃

S. fœtidus, the only species, in swamps and wet woods, mostly N.: sending up, in earliest spring, its purple-tinged or striped spathe enclosing the head of flowers, and later the large leaves, when full grown 1° – 2° long, in a cabbage-like tuft; the fruit 2′ – 3′ in diameter, the hard bullet-like seeds almost ½′ wide, ripe in autumn.

7. ÁCORUS, SWEET FLAG or CALAMUS. (Ancient name, from the Greek, said to refer to the use as a remedy for sore eyes.) ♃

1. A. Cálamus, Common Sweet-Flag: in wet grounds; sending up the 2-edged sword-shaped leaves, 2° or more high, from the horizontal pungent aromatic rootstock: fl. early summer.

113. TYPHACEÆ, CAT-TAIL FAMILY.

Marsh herbs, or some truly aquatic, with linear and straight-nerved erect (unless floating) long leaves, sheathing at base, and monœcious flowers on a dry spadix, destitute of calyx and corolla; the fruit dry and nut-like, 1-seeded, rarely 2-seeded.

Near to this belongs Pandànus, cult. for its foliage in some conservatories, with prickly toothed leaves crowded on woody stems.

1. TYPHA. Flowers indefinite, in a dense cylindrical spike terminating the long and simple reed-like stem; the upper part of stamens only, mixed with long hairs; the lower and thicker part of slender-stalked ovaries tapering into a style and below surrounded by numerous club-shaped bristles, which form the copious down of the fruit.
2. SPARGANIUM. Flowers collected in separate dense heads, scattered along the summit of the leafy stem; the upper ones of stamens only with some

minute scales interposed, the lower of pistils, each ovary with a few small scales at its base, the whole ripening into a spherical head of small nuts, which are wedge-shaped below and with a pointed tip.

1. TÝPHA, CAT-TAIL FLAG. (From Greek word for *fen*, in which these plants abound.) Fl. early summer. ♃

T. latifòlia, COMMON C. or REED-MACE; with flat leaves, these and the stem 6° – 10° high; no interval between the sterile and fertile part of the spike.

T. angustifòlia, NARROW-LEAVED C. Less common, smaller; leaves narrower, more channelled toward the base; commonly a space between the sterile and the fertile part of the spike.

2. SPARGÀNIUM, BUR-REED. (Name from Greek for a fillet, alluding to the ribbon-shaped leaves.) Fl. summer. ♃

S. eurycàrpum, GREAT B. Border of ponds and streams, 3° – 5° high, with panicled-spiked heads, the fertile when in fruit 1½″ thick, the nuts broad-tipped; stigmas 2; leaves ½′ – ¾′ wide, flat on upper side, keeled and concave-sided on the other.

S. simplex, SMALLER B. Only N.: in water; erect, sometimes floating, 1° – 2° high, mostly with a simple row of heads; leaves narrower; stigma simple, linear, as long as the style; nuts tapering to both ends and with a stalked base.

S. mínimum, SMALLEST B. Mostly with leaves floating in shallow water (6′ – 10′ long) and flat; heads few; stigma simple, oval; nuts oval, short-pointed and short-stalked.

II. PETALOIDEOUS DIVISION. Flowers not on a spadix, with a perianth (calyx and corolla), all or part of it usually colored.

114. ALISMACEÆ, WATER-PLANTAIN FAMILY.

Marsh herbs, with flowers on scapes or scape-like stems, in panicles, racemes, or spikes, with distinct calyx and corolla, viz. 3 sepals and 3 petals, and from 3 to many distinct pistils; stamens on the receptacle. Juice sometimes milky. The genuine Alismaceæ have solitary ovules and seeds, and wholly separate pistils. Some outlying related plants differing in these respects are annexed.

I. ARROW-GRASS FAMILY. Calyx and corolla colored alike (greenish). Anthers turned outwards. Ovaries 3 partly united, or a single 3 – 6-celled compound pistil. Leaves petiole-like, without a blade.

1. TRIGLOCHIN. Flowers perfect, small, in a slender spike or raceme, bractless. Calyx and corolla deciduous. Stamens 3 or 6, with oval anthers on short filaments. Ovary 3 – 6-celled, splitting when ripe from the central axis into as many closed and dry seed-like 1-seeded cells: stigmas sessile.
2. SCHEUCHZÈRIA. Flowers perfect, few and rather small, in a loose bracted raceme. Sepals and petals oblong, persistent. Stamens 6, with linear anthers. Pistils 3, with globular 2 – 3-ovuled ovaries slightly united at base, and diverging in fruit, forming 3 turgid pods. Stigmas flat, sessile.

II. WATER-PLANTAIN FAMILY PROPER. Calyx of 3 persistent green sepals. Corolla of 3 deciduous white petals. Anthers turned outwards. Ovaries many, tipped with short style or stigma, 1-ovuled, becoming akenes in fruit. Leaves sometimes only petioles, commonly with distinct blade, when the nerves or ribs are apt to be more or less joined by cross veins or netted.

3. ALISMA. Flowers perfect, loosely panicled. Petals involute in the bud. Stamens 6. Ovaries many, in a ring, very flat-sided, becoming coriaceous flat akenes, 2-3-keeled on the back.
4. ECHINODORUS. Flowers perfect, in proliferous umbels. Petals imbricated in the bud. Stamens 9 or more. Ovaries heaped in a head, becoming wingless akenes.
5. SAGITTARIA. Flowers monœcious, rarely diœcious or polygamous, in successive whorls, the sterile at the summit of the scape; the lowest fertile. Stamens usually numerous. Ovaries very many, heaped on the globular receptacle, in fruit becoming flat and winged akenes.

III. FLOWERING-RUSH FAMILY. (BUTOMEÆ.) Differs from the preceding mainly in the few ovaries having numerous ovules distributed all over the inside.

6. LIMNOCHARIS. Flowers perfect, long-peduncled. Petals large, yellow. Stamens numerous with slender filaments, a few of the outermost without anthers, the rest with linear anthers. Ovaries 6 or more, somewhat united at base. Leaves roundish and heart-shaped, long-petioled.

1. TRIGLÒCHIN, ARROW-GRASS. (Name in Greek means *three-pointed.*) Insignificant rush-like plants, in marshes, mostly where the water is brackish: fl. summer. ♃

T. palústre. Slender, 6′–18′ high, with linear-club-shaped ovary and fruit, the 3 pieces when ripe separating from the sharp-pointed base upwards.

T. marítimum. Stouter, 12′–20′ high, with fruit of about 6 pieces rounded at base. — Var. ELÀTUM, in bogs of the interior, N., 20′–30′ high, the pieces of the fruit sharp-angled on the back.

T. triándrum, a small slender species along the coast S., has only 3 sepals, no petals, 3 stamens, and a 3-lobed fruit.

2. SCHEUCHZÈRIA. (Named for the early Swiss botanist, *Scheuchzer.*)

S. palústris. Peat-bogs from Penn. N.: 1° high: fl. early summer. ♃

3. ALÍSMA, WATER-PLANTAIN. (The old Greek name, of uncertain meaning.) Fl. all late summer.

A. Plantàgo. Shallow water: leaves long-petioled, varying from or oblong-heart-shaped to lanceolate, 3–5-ribbed; panicle 1°–2° long of very many and loose small flowers. ♃

4. ECHINÓDORUS. (Named probably from Greek words for *prickly flask*, the head of fruit being as it were prickly-pointed by the styles, but hardly so in our species. The following occur in muddy or wet places, chiefly W. & S.: fl. summer; the flowering shoots or scapes mostly proliferous and creeping.

E. párvulus: a tiny plant, 1′–3′ high, with lanceolate or spatulate leaves, few-flowered umbels, 9 stamens, and almost pointless akenes. ①

E. rostràtus, with broadly heart-shaped leaves (1′–3′ long, not including the petiole) shorter than the erect scape, which bears a panicle of proliferous umbels; flower almost ½′ wide; 12 stamens; akenes beaked with slender styles. ①

E. radicans, with broadly heart-shaped and larger leaves (3′–8′ wide) which are very open or almost truncate at base; the creeping scapes or stems becoming 1°–4° long and bearing many whorls; flowers ½′–¾′ broad; akenes short-beaked.

5. SAGITTÀRIA, ARROW-HEAD. (From the Latin for *arrow*, from the sagittate leaves which prevail in the genus. In shallow water: fl. all summer. ♃

* *Filaments long and slender, i. e. as long as the linear-oblong anthers.*

S. lancifòlia. Common from Virginia S.: with the stout leaves 1°–3° and scapes 2°–5° high, the coriaceous blade of the former lance-oblong and

always tapering into the thick petiole, the nerves nearly all from the thick and prominent midrib.

S. variábilis. The common species everywhere, exceedingly variable; almost all the well-developed leaves arrow-shaped; filaments nearly twice the length of the anthers, smooth; akenes broadly obovate, with a long and curved beak; calyx remaining open.

S. calycina. Along rivers, often much immersed; many of the leaves linear or with no blades; the others mostly halberd-shaped; scapes weak, 3′–9′ high; pedicels with fruit recurved; filaments roughish, only as long as the anthers; akenes obovate, tipped with short horizontal style; calyx appressed to head of fruit and partly covering it; the fertile flowers show 9–12 stamens, the sterile occasionally some rudiments of pistils.

* * *Filaments very short and broad.*

S. heterophýlla. Common S. & W.: scapes 3′–2° high, weak; the fertile flowers almost sessile, the sterile long-pedicelled; filaments glandular-pubescent; akenes narrow-obovate, with a long erect beak; leaves linear, lanceolate, or lance-oblong, arrow-shaped with narrow lobes or entire.

S. graminea. Common S.: known from the foregoing by the slender pedicels of both kinds of flowers, small almost beakless akenes, and leaves rarely arrow-shaped.

S. pusílla. From N. Jersey S. near the coast: known by the small size (1–3′ high), few flowers, usually only one of them fertile and recurved in fruit; stamens only about 7, with glabrous filaments; akenes obovate, with erect beak; and leaves without a true blade.

S. nàtans, only S. is probably a large state of the last, with leaves having a floating blade 1′–2′ long, ovate or oblong, or slightly heart-shaped, 5–7 nerved.

6. LIMNÓCHARIS. (Name from the Greek means *delight of the pools.*)

L. Humbòldtii. Tender aquatic plant from S. America, which, turned into pools, spreads widely by its proliferous branching and rooting stems, and flowers all summer and autumn; each flower lasting but a day, the 3 broad sulphur-yellow petals 1′–1½′ long; pistils about 6; leaves about 3′ long, the midrib swollen below.

115. HYDROCHARIDACEÆ, FROG'S-BIT FAMILY.

Water-plants, with diœcious, monœcious, or polygamous flowers on scape-like peduncles from a sort of spathe of one or two leaves, the perianth in the fertile flowers of 6 parts united below into a tube which is coherent with the surface of a compound ovary:—we have three plants, two of them very common.

* *Floating, spreading by proliferous shoots; leaves long-petioled, rounded heart-shaped.*

1. LIMNOBIUM. Flowers monœcious or diœcious, from sessile or short-stalked leaf-like spathes, the sterile spathe of one leaf surrounding 3 long-pedicelled staminate flowers; the fertile 2-leaved, with one short-pedicelled flower. Perianth of 3 outer oval lobes (calyx) and 3 narrow inner ones (petals). A cluster of 6–12 unequal monadelphous stamens in the sterile flower: some awl-shaped rudiments of stamens and a 6–9-celled ovary in the fertile flower; stigmas 6–9, each 2-parted. Fruit berry-like, many-seeded.

   Growing under water, the fertile flowers only rising to the surface; the sterile (not often detected) breaking off their short stalks, and floating on the surface around the pistillate flowers.

2. ANACHARIS. Stems leafy and branching. Fertile flowers rising from a tubular spathe; the perianth prolonged into an exceedingly slender stalk-like tube, 6-lobed at top, commonly bearing 3–9 apparently good stamens: ovary 1-celled with a few ovules on the walls: style coherent with the tube of the perianth: stigmas 3, notched.

3. VALLISNERIA. Stemless; leaves all in tufts from creeping rootstocks. Fertile flowers with a tubular spathe, raised to the surface of the water on an

extremely long and slender scape: tube of the perianth not prolonged beyond the 1-celled ovary, with 3 obovate outer lobes (sepals) and 3 small inner linear ones (petals), and no stamens. Ovules very numerous lining the walls. Stigmas 3, sessile, 2-lobed. Fruit cylindrical, berry-like.

1. **LIMNÒBIUM,** FROG'S-BIT. (Name in Greek means *living in pools.*) Flowers whitish, the fertile ones larger, in summer. ♃

L. Spóngia. Floating free on still water S. & W.; has been found in bays of Lake Ontario: rooting copiously; leaves 1′–2′ long, purple beneath, tumid at base with spongy air-cells.

2. **ANÁCHARIS,** WATER-WEED. (Name from the Greek means *destitute of charms.*) Fl. summer. ♃

A. Canadénsis. Slow streams and ponds: a rather homely weed, with long branching stems, beset with pairs or whorls of pellucid and veinless 1-nerved minutely serrulate sessile leaves ($\frac{1}{2}$′–1′ long), varying from linear to ovate-oblong, the thread-like tube of the yellowish perianth often several inches long.

3. **VALLISNÈRIA,** TAPE-GRASS, EEL-GRASS of fresh water. (Named for *A. Vallisneri*, an early Italian botanist.) Fl. late summer. ♃

V. spiràlis. In clear ponds and slow streams, with bright green and grass-like linear leaves (1°–2° long), delicately nerved and netted; fertile scapes rising 2°–4° long, according to the depth of the water, afterwards coiling up spirally and drawing the fruit under water to ripen. — The leaves of this and the preceding are excellent to show *cyclosis.* (See Structural Botany, p. 31, Lessons, p. 167.)

116. PONTEDERIACEÆ, PICKEREL-WEED F.

A few water plants, distinguished from the foregoing by having the tubular corolla-like perianth free from the ovary, and the flowers perfect. Represented by

Schóllera gramínea, or WATER STAR-GRASS; a grass-like weed growing under water in streams, with branching stems beset with linear pellucid sessile leaves; the flower with a slender salver-form pale yellow perianth, of six narrow equal divisions raised to the surface on a very slender tube, and only 3 stamens.

Heteranthèra renifórmis, MUD-PLANTAIN, in mud or shallow water S. & W.; with floating round-kidney-shaped leaves on long petioles, and 3–5 ephemeral white flowers, from the sheathing base or side of a petiole; their perianth salver-form, with a slender tube, bearing 6 nearly equal divisions and 3 dissimilar stamens, one with a greenish, two with yellow anthers.

H. limòsa, in mud S. & W.: distinguished by its oblong or lance-oblong leaves, and solitary blue flower. — The only widely common plant of the family belongs to

1. **PONTEDÈRIA,** PICKEREL-WEED. (For the Italian botanist *Pontedera.*) Flowers in a terminal spike. Perianth of 6 divisions irregularly united below in a tube, the 3 most united forming an upper lip of 3 lobes, the others more spreading and with more or less separate or lightly cohering claws forming the lower lip, open only for a day, rolling up from the apex downwards as it closes; the 6-ribbed base thickening, turning green, and enclosing the fruit. Stamens 6, the 3 lower in the throat, with incurved filaments; the 3 upper lower down and shorter, often imperfect. Ovary 3-celled, 2 cells empty, one with a hanging ovule. Fruit a 1-celled 1-seeded utricle.

P. córdàta, COMMON P. Everywhere in shallow water; stem 1°–2° high, naked below, above bearing a single petioled heart-shaped and oblong or lance-arrow-shaped obtuse leaf, and a spike of purplish-blue flowers; upper lobe with a conspicuous yellowish-green spot; fl. all summer. ♃

117. ORCHIDACEÆ, ORCHIS FAMILY.

Herbs, with flowers of peculiar structure, the perianth adherent to the one-celled ovary (which has numberless minute ovules on 3 parietal placentæ), its chiefly corolla-like 6 parts irregular, 3 in an outer set answering to sepals, 3 within and alternate with these answering to petals, one of these, generally larger and always different from the others, called the *labellum* or *lip*: the stamens are *gynandrous*, being borne on or connected with the style or stigma, and are only one or two; the pollen is mostly coherent in masses of peculiar appearance. All perennials, and all depend upon insects for fertilization. Beginners will not very easily comprehend the remarkable structure of most Orchideous flowers. But our more conspicuous common species may be readily identified as to genera and species.

§ 1. EPIPHYTE OR AIR-PLANT ORCHIDS. *Of these a great variety are cultivated in the choicest conservatories. We have one in the most Southern States.*

1. EPIDENDUM. The 3 sepals and 2 petals nearly alike and widely spreading: the odd petal or lip larger and 3-lobed, its base united with the style, which bears a lid-like anther, containing 4-stalked pollen-masses, over the glutinous stigma.

§ 2. TERRESTRIAL ORCHIDS, *growing in the soil, in woods or low grounds.*

* *Anther only one, but of 2 cells, which when separated (as in Orchis) must not be mistaken for two anthers: pollen collected into one or more masses in each cell: stigma a glutinous surface.*

+ *Lip or odd petal produced underneath into a free honey-bearing horn or spur: pollen of each cell all connected by elastic threads with a central axis or stalk, the lower end of which is a sticky gland or disk, by adhesion to which the whole mass of pollen is dragged from the opening anther and carried off by insects.*

2. ORCHIS. The 3 sepals and 2 petals are conniving and arched on the upper side of the flower; the lip turned downwards (i. e. as the flower stands on its twisted ovary). Anther erect, its two cells parallel and contiguous; the 2 glands side by side just over the concave stigma, and enclosed in a sort of pouch or pocket opening at the top.

3. HABENARIA. Flower generally as in Orchis, but the lateral sepals commonly spreading; the glands attached to the pollen-masses naked and exposed.

+ + *No spur to the lip: anther borne on the back of the style below its tip, erect or inclined: the ovate stigma on the front. Flowers in a spike, small, white.*

4. SPIRANTHES. Flowers oblique on the ovary, all the parts of the perianth erect or conniving, the lower part of the lip involute around the style and with a callosity on each side of the base, its narrower tip somewhat recurved and crisped. Pollen-masses 2 (one to each cell), each 2-parted into a thin plate (composed of grains lightly united by delicate threads), their summits united to the back of a narrow boat-shaped sticky gland set in the beaked tip over the stigma. Leaves not variegated.

5. GOODYERA. Flowers like Spiranthes; but the lip more sac-shaped, closely sessile, and destitute of the callous protuberances at base. Leaves variegated with white veining.

+ + + *No spur to the lip, or one adherent to the ovary: anther inverted on the apex of the style, commonly attached by a sort of hinge: pollen 2 or 4 separate soft masses, not attached to a stalk or gland*

++ *Flowers rather large: pollen-masses soft, of lightly-connected powdery grains.*

ARETHUSA. Flower only one, on a naked scape; the 3 sepals and 2 petals lanceolate and nearly alike, all united at the base, ascending and arching over the top of the long and somewhat wing-margined style, on the petal-like top of which rests the helmet-shaped hinged anther, over a little shelf, the

lower face of which is the stigma. Lip broad, erect, with a recurving rounded apex and a bearded crest down the face. Pollen-masses 4, two in each cell of the anther.

7. CALOPOGON. Flowers 2, 3, or several, in a raceme-like loose spike; the lip turned towards the axis, diverging widely from the slender (above wing-margined) style, narrower at base, larger and rounded at the apex, strongly bearded along the face. Sepals and the 2 petals nearly alike, lance-ovate, separate and spreading. Anther lid-like: pollen-masses 4.

8. POGONIA. Flowers one or few terminating a leaf-bearing stem; the sepals and petals separate; lip crested or 3-lobed. Style club-shaped, wingless: stigma lateral. Anther lid-like, somewhat stalked: pollen-masses 2, only one in each cell.

++ ++ *Flowers mostly small, dull-colored, in a spike or raceme on a brownish or yellowish leafless scape: pollen-masses 4, globular, soft-waxy.*

9. CORALLORHIZA. Flowers with sepals and petals nearly alike; the lip broader, 2-ridged on the face below, from its base descends a short sac or obscure spur which adheres to the upper part of the ovary. Scape with sheaths in place of leaves; the root or rootstock thickish, much branched and coral-like.

10. APLECTRUM. Flowers as in No. 9, but no trace of a spur or sac, larger. Scape rising from a large solid bulb or corm, which also produces, at a different season, a broad and many-nerved green leaf.

* * *Anthers* 2 (Lessons p. 111. fig. 226), *borne one on each side of the style, and a trowel-shaped body on the upper side answers to the third stamen, the one that alone is present in other Orchids: pollen powdery or pulpy: stigma roughish, not glutinous.*

11. CYPRIPEDIUM. Sepals in appearance generally only 2, and petals 2, besides the lip which is a large inflated sac, into the mouth of which the style, bearing the stamens and terminated by the broad terminal stigma, is declined. Pollen sticky on the surface, as if with a delicate coat of varnish, powdery or at length pulpy underneath.

1. EPIDÉNDUM. (Name in Greek means *upon a tree*, i. e. an epiphyte.)

E. conópseum, our only wild Orchideous Epiphyte or Air-plant, is found from South Carolina S. & W. on the boughs of Magnolia, &c., clinging to the bark by its matted roots, its tuberous rootstocks bearing thick and firm lanceolate leaves (1′–3′ long), and scapes 2′–6′ long, with a raceme of small greenish and purplish flowers, in summer. (Lessons, p. 34, 35, fig. 35.)

2. ÓRCHIS. (The ancient name, from the Greek.) We have only one true Orchis, viz.

O. spectábilis, Showy Orchis. Rich hilly woods N.; with 2 oblong obovate glossy leaves (3′–5′ long) from the fleshy-fibrous root, and a leafy-bracted scape 4′–7′ high, bearing in a loose spike a few pretty flowers, pink-purple, the ovate lip white: in late spring.

3. HABENÀRIA, popularly called ORCHIS. (Name from Latin *habena*, a rein or thong, from the shape of the lip of the corolla in some species.) Flowers in a terminal spike, each in the axil of a bract, in late spring or summer. In all but one species the ovary twists and the lip occupies the lower or anterior side of the flower.

§ 1. Fringed Orchis. *Lip and often the other petals cut-fringed or cleft, shorter than the long curving spur: cells of the anther more or less diverging and tapering below, the sticky gland at their lower end strongly projecting forwards. These are our handsomest wild Orchises: all grow in bogs or low grounds: stems leafy,* 1°–4° *high.*

* *Flowers violet-purple, in summer: the lip fan-shaped, 3-parted nearly down to the stalk-like base, and the divisions more or less fringed.*

H. fimbriàta, Larger Purple Fringed O. Wet meadows from Penn. N. E.; lower leaves oval or oblong, upper few and small; raceme-like spike oblong, with rather few large flowers in early summer; petals oblong, toothed down the sides; lip almost 1′ wide, hanging, cut into a delicate fringe.

H. psycòdes, Smaller Purple Fringed O. Common, especially N.: leaves oblong, above passing into lance-linear bracts; spike cylindrical, 4′–10′ long, crowded with smaller and fragrant flowers; lateral petals wedge-obovate, almost entire; lip spreading, only ½′ wide, cut into denser fringe.

H. peramœna. From Penn. W. & S. along and near the mountains: flowers of size intermediate between the two preceding, the broad wedge-shaped lobes of the lip moderately cut-toothed, but not fringed.

* * *Flowers greenish or yellowish-white, in late summer: glands oval or lanceolate, almost facing each other: spike long and loose.*

H. leucophæa. From Ohio W. & S.: 2°–4° high; leaves lance-oblong; flowers rather large, the fan-shaped lip 3-parted, ¾′ long, and many-cleft to the middle into a thread-like fringe.

H. lácera, Ragged Fringed O. Common N. & E.: 1°–2° high; leaves lanceolate or oblong; petals oblong-linear, entire; divisions of the slender-stalked 3-parted lip narrow and slenderly fringed.

* * * *Flowers bright white, in summer: the lip fringe-margined but not cleft.*

H. blephariglóttis, White Fringed O. Peat-bogs N.: like the next, but rather smaller, 1° high, the fringe of the lance-oblong lip hardly equal to the width of its body.

* * * * *Flowers bright orange-yellow, in late summer: glands orbicular, projecting on the beak-pointed bases of the very diverging anther-cells: ovary and pod long, tapering to the summit.*

H. ciliàris, Yellow Fringed O. Sandy bogs: 1½°–2° high; leaves oblong or lanceolate; spike short, of many crowded very showy flowers; petals cut-fringed at apex, the oblong body of the lip narrower than the copious long and fine fringe.

H. cristàta, from Penn. S.: smaller, with narrower leaves, and flowers only a quarter the size of the preceding, the petals crenate, and the ovate lip with a narrow lacerate fringe.

§ 2. *Yellow, green, or white species, with lip entire, at least not fringed.*

* *Stem leafy: leaves oblong or lanceolate: flowers small: anther-cells nearly parallel.*

H. íntegra. Pine barrens from New Jersey S.: resembles H. cristata, having small bright orange-yellow flowers, but the lip is ovate and entire or barely crenulate.

H. viréscens. Wet grounds, common: 10′–20′ high, with a conspicuously bracted at length long and loose spike of small dull-green flowers; the lip oblong, almost truncate at the apex, its base with a tooth on each side and a nasal protuberance on the face; spur slender, club-shaped.

H. víridis, var. **bracteàta.** Cold damp woods N.: 6′–12′ high, with lower leaves obovate, upper reduced to bracts of the short spike, which are much longer than the green flowers; lip truncate and 2–3-toothed at the tip, very much longer than the sac-shaped spur.

H. hyperbòrea. Cold low woods and bogs N: 6′–2° high, very leafy; leaves lanceolate; spike dense, often long; flowers greenish, the lanceolate lip like the other petals, spreading, entire, about the length of the incurved spur.

H. dilatàta. Resembles the last, grows in same places, but commonly more slender and with linear leaves; flowers white, less wide, open, the lanceolate lip with a rhombic-dilated base; glands strap-shaped.

H. nívea. Sandy bogs, from Delaware S.: 1°–2° high, all the upper leaves bract-like; flowers white, in a loose cylindrical spike, very small, different from all the rest in having the (white) ovary without a twist, and the linear-oblong entire lip with its long thread-like spur therefore looking inwards.

Stem a naked scape: the leaves only 2 at the ground: flowers pretty large in a loose spike: anther-cells widely diverging at their tapering or beak-like projecting base.

H. orbiculàta, Great Green O. Evergreen woods and hillsides N.: a striking plant; its exactly orbicular leaves 4′–8′ wide, bright green above and silvery beneath, lying flat on the ground; scape 1°–2° high, bracted, bearing many large greenish-white flowers in a loose raceme; sepals roundish; lip nar-

rowly spatulate-linear and drooping; spur about 1½′ long, curved, gradually thickened towards the blunt tip: fl. July.

H. Hoókeri. Sandy woods from Penn. N.: smaller in all parts, flowers in June; the orbicular leaves only 3′–5′ broad and flat on the ground; scape naked, 6′–12′ high, bearing fewer yellowish-green flowers in a strict spike; sepals lance-ovate; lip lanceolate and pointed, incurved, the other petals lance-awl-shaped; spur slender, acute, nearly 1′ long.

4. SPIRÁNTHES, LADIES'-TRESSES. (Name from the Greek, denotes that the flowers are spiral: they often are apparently spirally twisted in the spike.) Flowers white. The species are difficult; the following are the commonest.

* *Flowers crowded in 3 ranks in a close spike: wet banks or bogs.*

S. latifòlia. Only from Delaware N.: known by its oblong or lance-oblong leaves (1′–3′ long), all at the base of the scape, and narrow spike of small smooth flowers early in June.

S. Romanzoviàna. Cold bogs, from N. New England W.: 5′–15′ high, with oblong-lanceolate or grassy-linear leaves, a dense spike of flowers at midsummer, all 3 sepals and 2 petals conniving to form an upper lip.

S. cérnua, Common E. and S.: 6′–20′ high, with lance-linear leaves, cylindrical often lengthened spike, and lower sepals not upturned but parallel with the lower petal or lip: fl. in autumn.

* * *Flowers in one straight or often spirally twisted rank, in summer.*

S. gramínea. Wet grassy places from N. England S.: stem about 1° high, towards its base and at the fleshy root bearing linear or lance-linear leaves, which mostly last through the flowering season; spike dense and much twisted, rather downy.

S. grácilis. Hills and sandy plains: scape s'ender, 8′–18′ high, bearing a slender spike; leaves all from the tuberous root, short, ovate or oblong, apt to wither away before the small flowers appear in late summer.

5. GOODYÈRA, RATTLESNAKE PLANTAIN. (Named for *John Goodyer*, an English botanist.) Flowers small, in summer, greenish-white, spiked on a scape; the leaves all clustered at the root, ovate, small.

G. rèpens. Evergreen woods N.: 3′–8′ high, slender; flowers in a loose one-sided spike, with inflated sac-shaped lip.

G. pubéscens. Oak and pine woods E. & S.: 6′–12′ high; larger, with leaves more beautifully white-reticulated, and flowers not one-sided in the denser spike; lip globular.

G. Menzièsii. Woods, only from New York W.: 9′–12′ high; leaves less reticulated; flowers loose in the spike, narrower and pointed in the bud, the lip hardly sac-shaped at the base and tapering to a narrow apex.

6. ARETHÙSA. (Mythological name of a nymph and fount.in.) Fl. late spring.

A. bulbòsa. A charming little plant, in wet bogs N.: consists of a scape 6′–10′ high rising from a solid bulb or corm, sheathed below with one or two green bracts, and terminated with the bright rose-pink flower 1′–2′ long.

7. CALOPÒGON. (Name in Greek means *beautiful beard*, referring to the lip.) Fl. early summer.

C. pulchéllus. Wet bogs: scape about 1° high, from a small solid bulb, slender, bearing next the base a long linear or lanceolate many-nerved grass-like leaf, and at the summit 2–6 beautiful pink-purple flowers (1′ broad), the lip as if hinged at its base, bearded with white, yellow, and purple club-shaped hairs.

8. POGÒNIA. (Name in Greek means *bearded*, i. e. on the lip: this is hardly the case in most of our species.) We have several, but the only widely common one is

P. ophioglossoides. Wet bogs along with the Calopogon, and in blossom at the same time: stem 6′–9′ high from a root of thick fibres, bearing

an oval or lance-oblong closely sessile leaf near the middle, and a smaller one or bract near the terminal flower, sometimes a second flower in its axil; flower 1′ long, pale rose-color or whitish, sweet-scented; sepals and petals nearly alike; lip erect, beard-crested and fringed.

9. CORALLORHÌZA, CORAL-ROOT (which the name means in Greek).

C. innàta. Low woods, mostly N.: 3′–6′ high, yellowish, with 5–10 very small almost sessile flowers; lip 3-lobed or halberd-shaped at base: fl. spring.

C. odontorhìza. Rich woods, common only S.: 6′–16′ high, thickened at base, brownish or purplish, with 6–20 pedicelled flowers, and lip not lobed but rather stalked at base, the spur obsolete.

C. multiflòra. Common in dry woods, 9′–20′ high, purplish, stout, with 10–30 short-pedicelled flowers, lip deeply 3-lobed, and adnate spur manifest.

10. APLÉCTRUM, PUTTY-ROOT, ADAM-AND-EVE. (Name, from the Greek, means *destitute of spur.*)

A. hyemàle. Woods, in rich mould, mostly towards the Alleghanies and N.: scape and dingy flowers in early summer; the large oval and plaited-nerved petioled leaf appears towards autumn and lasts over winter; solid bulbs one each year, connected by a slender stalk, those of at least two years found together (whence one of the popular names), 1′ thick, filled with strong glutinous matter, which has been used for cement, whence the other name.

11. CYPRIPÈDIUM, LADY'S SLIPPER, MOCCASON-FLOWER. (Greek name for *Venus*, joined to that for *a slipper* or *buskin.*) Two exotic species are not rare in conservatories; the others are among the most ornamental and curious of our wild flowers: in spring and early summer. Rootstocks very short and knotty, producing long and coarse fibrous roots.

§ 1. *The three sepals separate: stem leafy, one-flowered.*

C. arietìnum, RAM'S HEAD C. Cold bogs N.: not common; the smallest species, with slender stem 6′–10′ high, oblong-lanceolate leaves, and a dingy purplish flower, the sac conical and in some positions resembling a ram's head, one sepal lance-ovate, the two others and the two petals linear.

§ 2. *Two of the sepals united by their edges into one under the sac or slipper, but their very tips sometimes separate.*

* *Stem 1°–2° high, leafy to the 1–3-flowered summit: leaves lance-oblong or ovate, with many somewhat plaited nerves, more or less pubescent: sac or slipper horizontal, much inflated, open by a rather large round orifice.*

+ *Sepals and linear wavy-twisted petals brownish, pointed, larger than the sac.*

C. pubéscens, YELLOW LADY'S-SLIPPER. Low woods and bogs, mainly N.: sac light yellow, higher than broad, convex above; sepals long-lanceolate: flowers early summer, scentless.

C. parviflòrum, SMALLER YELLOW L. In similar situations; stems and leaves generally smaller, and flower about half the size of the other, somewhat fragrant, the sac broader than high, deep yellow, and the lance-ovate sepals browner.

C. cándidum, SMALL WHITE L. Bogs and low prairies, chiefly W.: small, barely 1° high, slightly pubescent; sac like that of preceding but white.

+ + *Sepals and petals broad or roundish and flat, white, not larger than the sac.*

C. spectábile, SHOWY L., and deserving the name, in bogs and rich low woods N., and along the mountains S.: downy, 2° or more high, with leaves 6′–8′ long, white flowers with the globular lip (1½′ long) painted with pink-purple, in July.

* * *Scape naked, bearing a small bract and one flower at summit.*

+ *Wild species, with only a pair of oblong many-nerved downy leaves at the root.*

C. acàule, STEMLESS L. Moist or sandy ground in the shade of evergreens: scape 8–12′ high; sepals and petals greenish or purplish, the latter

linear, shorter than the rose-purple oblong-obovate drooping sac, which is split down the front but nearly closed: fl. spring.

+ + *East Indian species of the conservatory, with several thick and firm keeled leaves in 2 ranks at the root: sac hanging, largely open at top.*

C. insígne, has linear strap-shaped cartilaginous leaves, and yellow flower with some greenish and purple-spotted.

C. venústum, with more fleshy oblong-strap-shaped mottled and spotted leaves, and purplish flower with some green and yellow.

118. SCITAMINEÆ, BANANA FAMILY.

Here is assembled a group of tropical or subtropical plants, with leaves having distinct petiole and blade, the latter traversed by nerves running from the midrib to the margin; flowers irregular, with a perianth of at least two ranks of divisions, below all combined into a tube which is adherent to the 3-celled ovary; the stamens 1 – 6 and distinct. We have only two, by no means common, wild representatives on our southeastern borders; the cultivated ones are chiefly grown for their ornamental foliage, and most of them are rarely seen in blossom. They may therefore be simply referred to, as follows.

I. GINGER FAMILY. Seeds, rootstocks, or roots hot-aromatic. Stamen only one, with a 2-celled anther, commonly embracing the style, but not united with it.

Hedýchium Gardneriànam, GARLAND-FLOWER, cult. from India: stems $3^{\circ}-4^{\circ}$ high, furnished to the top with oblong 2-ranked leaves, terminating in a large spike of handsome light-yellow flowers, a slender tube bearing 6 divisions which may be likened to those of an Orchideous flower, one (answering to the lip) much larger and broader than the 5 others, and a very long protruding reddish filament terminated by a yellow anther sheathing the style up almost to the stigma.

II. ARROWROOT or INDIAN-SHOT FAMILY. No hot-aromatic properties, the thick rootstocks, &c., commonly contain much starch, from which genuine arrowroot is produced. Stamen only one with an anther, and that one-celled.

Thàlia dealbàta, wild in marshes and ponds far S., is dusted over with a white powder, the heart-ovate long-petioled leaves all from the root, reed-like scape branching above into panicled spikes of small much-bracted purple flowers.

Maránta zebrìna, rarely flowers, but is a showy leaf-plant in conservatories; the oblong leaves 2 or 3 feet long, purple beneath, the upper surface satiny and with alternating stripes of deep and pale green; flowers dull purple inconspicuous, in a bracted head or spike near the ground on a short scape.

Cánna Índica, COMMON INDIAN SHOT (so called from the hard shot like seeds, these several in the 3 cells of the rough-walled pod): frequently planted for summer flowering; the lance-ovate or oblong pointed leaves $6'-12$ long; flowers several in a simple or branching spike, about $2'$ long, red varying to yellow, or variegated; stamen with petal-like filament bearing the anther on one side, otherwise resembling the 3 divisions of an inner corolla these probably transformed sterile stamens. — The following, more magnificent for summer foliage, and sometimes for flowers, are choicer sorts, but much confused as to species.

C. Warszewiczii, $4^{\circ}-5^{\circ}$ high, with mostly purplish or purple-margined pointed leaves, and crimson-red flowers.

C. discolor, grows 6°–10° high, with broad purple-tinged very large leaves, and crimson or red-purple flowers.

C. glàuca, especially its var. Annæi, 8°–13° high, with its glaucous pale taper-pointed leaves, and yellow or red flowers 4' long.

C. flàccida, wild in swamps from South Carolina S.: 2°–4° high, with ovate-lanceolate pointed leaves, and yellow flowers 3'–4' long; all the inner divisions obovate and wavy, lax, the 3 outer or calyx reflexed.

III. BANANA FAMILY proper. Not aromatic or pungent. Stamens 5 with 2-celled anthers, and an abortive naked filament.

Strelítzia Reginæ, a large stemless conservatory plant, from the Cape of Good Hope, winter-flowering, with 2-ranked root-leaves, their long rigid petioles bearing an ovate-oblong thick blade; scape bearing at apex an oblique or horizontal and rigid conduplicate spathe, from which several large and strange-looking blossoms appear in succession; the 3 outer divisions of the perianth 3'–4' long, orange-yellow, one of them conduplicate and taper-pointed, and somewhat like the two larger of the bright blue inner set, or true petals, which are united and cover the stamens, the other petal inconspicuous.

Mùsa sapiéntum, Banana; cult. for foliage and for the well-known fruit; the enwrapping bases of the huge leaves forming a sort of tree-like succulent stem, 10°–20° high; the flower-stalk rising through the centre, and developing a drooping spike, the flowers clustered in the axil of its purplish bracts; perianth of 2 concave or convolute divisions or lips, the lower 3–5-lobed at the apex and enclosing the much smaller upper one; berry oblong, by long cultivation (from offshoots) seedless. (Lessons, p. 19, fig. 47.)

M. Cavendíshii. A dwarf variety, flowering at a few feet in height, is the more manageable one, principally cultivated for fruiting.

119. BROMELIACEÆ, PINE-APPLE FAMILY.

Tropical or subtropical plants, the greater part epiphytes, with dry or fleshy, mostly rigid, smooth or scurfy leaves, often prickly edged, and perfect flowers with 6 stamens. — represented by several species of Tillandsia in Florida, a small one further north, and several of various genera in choice conservatories, not here noticed.

Ananássa sativa, Pine-Apple; cult. for its fruit, the flowers abortive, and sometimes for foliage, especially a striped-leaved variety.

Tillándsia usneoìdes, the Long Moss or Black Moss (so called), hanging from trees in the low country from the Dismal Swamp S.: gray-scurfy, with thread-shaped branching stems, linear-awl-shaped recurved leaves, and small sessile green flowers; the ovary free, forming a narrow 3-valved pod, filled with club-shaped hairy-stalked seeds: fl. summer.

120. AMARYLLIDACEÆ, AMARYLLIS FAMILY.

Chiefly perennial herbs, with leaves and scape from a bulb, corm, &c., the leaves nerved from the base, and rarely with any distinction of blade and petiole; the perianth regular or but moderately irregular and colored, its tube adherent to the surface of the 3-celled ovary; and 6 stamens with good anthers. Bulbs acrid, some of them poisonous. To this family belong many of the choicer bulbs of house-culture, only the commonest here noticed.

§ 1. *Scape and linear hairy leaves from a little solid bulb or corm.*

1. HYPOXYS. Perianth 6-parted nearly to the ovary, spreading, greenish outside, yellow within, persistent and withering on the pod.

§ 2. *Scape and mostly smooth leaves from a coated bulb.*

* *A cup-shaped, funnel-shaped, or saucer-shaped crown on the throat of the perianth.*

2. NARCISSUS. Perianth with a more or less cylindrical tube, 6 equal widely spreading divisions, and stamens of unequal length included in the cup or crown. Scape with one or more flowers, from a scarious 1-leaved spathe.
3. PANCRATIUM. Perianth with a slender tube, 6 long and narrow divisions, and a cup to which the long filaments adhere below, and from the edge of which they project. Anthers linear, fixed by the middle. Scape bearing a few flowers in a cluster, surrounded by some leaf-like or scarious bracts.

* * *No cup nor crown to the flower, or only minute scales sometimes in the throat.*

+ *Filaments borne on the tube of the flower: anthers fixed by the middle, versatile: spathe of 1 or 2 scales or bracts.*

4. CRINUM. Perianth with a slender long tube and 6 mostly long and narrow spreading or recurved divisions. Stamens long. Scape solid, bearing few or many flowers, in an umbel-like head. Bulb often columnar and rising as if into a sort of stem. Leaves in several ranks.
5. AMARYLLIS. Perianth various; the divisions oblong or lanceolate. Scape bearing one or more flowers. Leaves mostly 2-ranked.

+ + *Filaments on the ovary at the base of the 6-parted perianth: anthers erect, not versatile: spathe a bract opening on one side.*

6. GALANTHUS. Scape with usually a single small flower on a nodding pedicel. Perianth of 6 oblong separate concave pieces; the three inner shorter, less spreading, and notched at the end. Anthers and style pointed.
7. LEUCOIUM. Scape bearing 1–7 flowers on nodding pedicels. Perianth of 6 nearly separate oval divisions, all alike. Anthers blunt. Style thickish upwards.

§ 2. *Stems leafy, or scape beset with bracts, from a tuberous rootstock or crown.*

8. ALSTRŒMERIA. Stems slender and weak or disposed to climb, leafy to the top, the thin lanceolate or linear leaves commonly twisting or turning over. Flowers in a terminal umbel. Perianth 6-parted nearly or quite to the ovary, rather bell-shaped, often irregular as if somewhat 2-lipped. Stamens more or less declined. Style slender: stigma 3-cleft.
9. POLIANTHES. Stem erect and simple from a thick tuber, bearing long-linear channelled leaves, and a spike of white flowers. Perianth with a cylindrical and somewhat funnel-shaped slightly curved tube, and 6 about equal spreading lobes. Stamens included in the tube: anthers erect. The summit of the ovary and pod free from the calyx-tube; in this and other respects it approaches the Lily Family.
10. AGAVE. Leaves thick and fleshy with a hard rind and a commonly spiny margin, tufted on the crown, which produces thick fibrous roots, and suckers and offsets; in flowering sends up a bracted scape, bearing a spike or panicle of yellowish flowers. Perianth tubular-funnel-shaped, persistent, with 6 narrow almost equal divisions. Stamens projecting: anthers linear, versatile. Pod containing numerous flat seeds.

1. HYPÓXYS, STAR-GRASS. (Name from the Greek, means *acute at the base;* the pod is often so.)

H. erècta, the common species, in grass; with few-flowered scape 3′–8′ high, and leaves at length longer; yellow star-like flower over ½′ broad.

2. NARCÍSSUS. (Greek name, that of the young man in the mythology who is said to have been changed into this flower.) Most of them are perfectly hardy: fl. spring.

N. poéticus, Poet's N. Leaves nearly flat; scape 1-flowered; crown of the white flower edged with pink, hardly at all projecting from the yellowish throat: in full double-flowered varieties the crown disappears.

N. biflòrus, Two-flowered N., or Primrose Peerless of the old gardeners, has two white or pale straw-colored flowers, and the crown in the form of a short yellow cup.

N. polyánthos is the parent of the choicer sorts of Polyanthus N.; flowers numerous, white, the cup also white.

N. Tazétta, Polyanthus N. Leaves as of the preceding linear and nearly flat, glaucous; flowers numerous in an umbel, yellow or sometimes white, with the crown a golden or orange-colored cup one third or almost one half the length of the divisions.

N. Jonquilla, Jonquil. Leaves narrow, rush-like or half-cylindrical; flowers 2 to 5, small, yellow, as also the short cup, very fragrant.

N. Pseudo-Narcissus, Daffodil. Leaves flat, and 1-flowered scape short; flower large, yellow, with a short and broad tube, and a large bell-shaped cup, having a wavy-toothed or crisped margin, equalling or longer than the divisions: common double-flowered in country gardens.

3. PANCRÀTIUM. (Name in Greek means *all powerful:* no obvious reason for it.) Flowers large, showy, fragrant, especially at evening in summer. Cult. at the North; the following wild S. in wet places on and near the coast.

P. maritimum. Glaucous; leaves linear, erect; scape barely flattish; perianth 5′ long, its green tube enlarging at summit into the funnel-shaped 12-toothed cup, to the lower part of which the spreading narrow-lanceolate divisions of the perianth are united.

P. rotàtum (or P. Mexicànum). Leaves linear-strap-shaped, widely spreading, bright green, 2′ or more wide; scape sharply 2-edged; slender tube of the perianth and its linear widely spreading divisions each about 3′ long, the latter wholly free from the short and broadly open wavy-edged cup.

4. CRÌNUM. (The Greek name for a Lily.) Showy conservatory plants, chiefly from tropical regions; one wild S.

C. amábile, from East Indies; the huge bulb rising into a column; leaves becoming several feet long and 3′–5′ wide; flowers numerous, 8′–10′ long, crimson-purple outside, paler or white within.

C. Americànum, wild in river swamps far S.; much smaller, with a globular bulb; scape 1°–2° high; flower white, 6′–7′ long.

5. AMARÝLLIS. (Dedicated to the nymph of this name.) One wild species S.; many in choice cultivation, and the species mixed. The following are the commonest types.

A. Atamásco, Atamasco Lily, wild from Virginia S. in low grounds; scape 6′–12′ high, mostly shorter than the glossy leaves; flower 2′–3′ long, single from a 2-cleft spathe, regular, funnel-form, white and pinkish; stamens and style declined.

A. formosíssima, Jacobæan or St. James's Lily, of the section Sprekèlia: cult. from South America: scape bearing a single large and declined deep crimson-red flower, with hardly any tube, and 2-lipped as it were, three divisions recurved-spreading upwards, three turned downwards, these at base involute around the lower part of the deflexed stamens and style.

A. Reginæ, from South America; with 2–4 large almost regular nodding flowers, crimson-red, with hardly any tube, and the deflexed stamens curved upwards at the end.

A. Belladónna, from the Cape of Good Hope; has elongated bulbs, channelled narrow leaves shorter than the solid scape, and several almost regular large rose-red fragrant flowers, funnel-form with very short tube, the stamens not much declined.

A. speciòsa, or Vallòta purpùrea, from Cape of Good Hope; the scarlet-red flowers with funnel-shaped tube rather longer than the broad ovate and nearly equal spreading divisions.

6. GALÁNTHUS, Snowdrop. (Name formed of the Greek words for *milk* and *flower*, probably from the color.) Fl. earliest spring.

G. nivàlis, of Europe, sends up soon after the winter's snow leaves the ground a pair of linear pale leaves and a scape 3′–6′ high, bearing its delicate drooping white flower, the inner divisions tipped with green: a variety is full double.

7. LEUCÒIUM, SNOWFLAKE. (Ancient Greek name means *White Violet.*) In gardens from Europe; much like Snowdrops on a larger scale, flowering later, the scape more leafy at base, and leaves bright green.

L. vérnum, SPRING S. Scape about 1° high, mostly 1-flowered, in spring; pod pear-shaped and 6-sided.

L. æstivum, SUMMER S. Scape 2° high, bearing 3–7 rather broader flowers in late spring or early summer; pod rounder.

8. ALSTRŒMÈRIA. (Named by Linnæus for his friend *Baron Alstrœmer.*) Plants of the conservatory, from W. South America, of mixed species.

A. Pelegrìna, LILY OF THE INCAS, from Peru. Flowers few or solitary at the end of the branches, open, rose-colored or whitish, blotched with pink and spotted with purple, with some yellow on the inner divisions.

A. psittacìna. Flowers umbelled, funnel-form in shape, the spatulate divisions more erect and close, red, tipped with green and brown-spotted.

A. versícolor. Flowers few, terminating the drooping or spreading branches, yellow spotted with purple.

9. POLIÁNTHES, TUBEROSE. (Name from Greek words for *city* and *flower*; therefore not *Polyanthes.* And the popular name relates to the tuberous rootstock, therefore not *Tube-Rose.*)

P. tuberòsa, the only species cultivated, probably originally from Mexico; the tall stem with long several-ranked leaves at base and shorter and sparser ones towards the many-flowered spike (produced in autumn when planted out); the blossoms very fragrant, white, or slightly tinged with rose, the choicer sorts full-double.

10. AGÀVE, AMERICAN ALOE. (Name from Greek word for *wonderful.*) Plants flower only after some years, and die after maturing the fruit.

A. Virgínica, of sterile soil from Virginia to Ill. and S.; has lance-oblong denticulate and spiny-tipped leaves 6′–12′ long, and scape bearing a loose simple spike of small flowers, 3°–6° high.

A. Americàna, of Mexico, is the common CENTURY PLANT or AMERICAN ALOE; with very thick spiny-toothed and spine-pointed leaves, 2°–4° long, pale green, or a variety yellowish-striped, the scape when developed from old plants (said to flower only after 100 years in cool climates) tree-like, bearing an ample panicle.

121. IRIDACEÆ, IRIS FAMILY.

Distinguished by the equitant erect leaves (Lessons, p. 68, fig. 133, 134), of course 2-ranked, and the 3 stamens with anthers facing outwards. Flowers showy, colored, mostly from a spathe of two or more leaves or bracts; the tube of the perianth coherent with the 3-celled ovary and often prolonged beyond it, its divisions 6 in two sets (answering to sepals and petals), each convolute in the bud. Style 1, or rarely 3-cleft: stigmas 3, opposite the 3 stamens and the outer divisions of the perianth. Fruit a 3-celled and many-seeded pod. Stems or herbage rising from a rootstock, tuber, or solid bulb (corm, Lessons, p. 45, fig. 71, 72); these are acrid, sometimes very much so. All are perennial herbs.

§ 1. *Perianth of 3 outer recurving, and 3 inner commonly smaller erect or incurving divisions; stigmas or more properly lobes of the style petal-like.*

1. IRIS. Flowers with tube either slightly or much prolonged beyond the ovary, in the latter case coherent also with the style. Stamens under the overarching branches of the style: anthers linear or oblong, fixed by the base. The real stigma is a shelf or short lip on the lower face of the petal-like branch of the style, only its inner surface stigmatic. Pod 3–6-angled.

§ 2. *Perianth parted almost to the base into 6 nearly equal widely spreading divisions: stamens separate or nearly so: style 3 – 6-lobed.*

2. PARDANTHUS. Foliage and aspect of an Iris with leafy branching stem, from a rootstock. Divisions of the flower oblong with a narrow base. Filaments slender, much longer than the anthers. Style long, club-shaped, its simple branches tipped with a broad and blunt stigma. Pod pear-shaped; the valves falling away expose the centre covered with black berry-like seeds.

3. NEMASTYLIS. Stem simple or sparingly branching above, from a solid bulb like that of a Crocus. Divisions of the flower obovate. Filaments awl-shaped, much shorter than the linear anthers. Style short, its 3 lobes parted each into two, bearing long and thread-like diverging stigmas. Pod truncate. Seeds dry, angular.

§ 3. *Perianth deeply cleft or parted into 6 widely spreading divisions: stamens monadelphous to the top: style long: stigmas 3 or 6, thread-like: flowers opening in sunshine and but once for a few hours.*

4. SISYRINCHIUM. Root mostly fibrous: leaves grass-like. Divisions of the wheel-shaped flower all alike. Stigmas 3, simple.

5. TIGRIDIA. From a solid bulb with some hard brittle coating. Leaves lanceolate, large, very much plaited. Three outer divisions of the perianth very large and with a concave base; the other 3 very much smaller and fiddle-shaped. Stigmas 3, each 2-cleft.

§ 4. *Perianth tubular at base, the 6 divisions all more or less spreading: stamens separate: style long: stigmas 3, more or less dilated: flowers lasting for several days. Plants from solid bulbs or corms.* (Lessons, p. 45, fig. 71, 72.)

6. GLADIOLUS. Flowers numerous in a spike, on a rather tall leafy stem remaining open, irregular, the short-funnel-shaped tube being somewhat curved, and the divisions more or less unequal, the flower commonly oblique or as if somewhat 2-lipped. Stamens (inserted on the tube,) and style ascending. Leaves sword-shaped, strongly nerved.

7. CROCUS. Flowers and narrow linear leaves rising from the bulb, the ovary and pod seldom raised above ground: perianth with a long and slender tube; its oval or roundish divisions alike, or the 3 inner rather smaller, concave, fully spreading only in sunshine. Leaves with revolute margins.

There are besides many tender plants of the family in choice collections, the greater part confined to the conservatories, — mostly belonging to

Íxia maculàta, of Cape of Good Hope, and others, once of that genus, now called SPARÁXIS, WATSÒNIA, &c.; also to MONTBRÈTIA or TRITÒNIA, &c.

Schizóstylis coccínea, from South Africa, lately introduced: not very tender, with long and keeled linear leaves, and stems 3° high, bearing a spike of bright crimson-red flowers 2′ across, the ovate acute lobes all alike and widely spreading from a narrow tube; the slender style deeply cleft (whence the name) into 3 thread-like branches.

Moræa iridoides, of the Cape; very like an Iris, as the specific name denotes; but the 6 divisions of the perianth all nearly alike and widely spreading, white with a yellow spot on the 3 outer ones.

1. ÌRIS, FLOWER-DE-LUCE, BLUE FLAG. (Greek and Latin mythological name, and name of the *rainbow.*) Fl. spring and early summer.

§ 1. *Wild species of the country, all with creeping rootstocks.*

* *Dwarf, with simple very short stems (or only leafy tufts), 1 – 3-flowered in early spring, from creeping and branching slender rootstocks, here and there tuberous-thickened: flowers violet-blue, with a long slender tube, and no beard.*

I. vérna, SLENDER DWARF-IRIS. Wooded hillsides, from Virginia and Kentucky S.; with linear grassy leaves, tube of flower about the length of its almost equal divisions, which are on slender orange-yellow claws, the outer ones crestless.

I. cristàta, CRESTED D. Along the Alleghanies, &c., sometimes cult.; with lanceolate leaves, or the upper ovate-lanceolate, tube of flower (2′ long) much longer than the scarcely stalked divisions, the outer ones crested; pod sharply triangular.

§ 1. *Stemless: the large flower with a long tube rising directly from a thin-coated solid bulb or corm: anthers 2-celled.*

3. COLCHICUM. Perianth resembling that of a Crocus. Stamens borne on the throat of the long-tubular perianth. Styles very long.

§ 2. *Perianth without any tube, of 6 distinct or almost separate divisions.*

* *Anthers 2-celled, short: flowers in a simple raceme or spike: pod loculicidal.*

4. CHAMÆLIRIUM. Flowers diœcious or mostly so. Perianth of 6 small and narrow white pieces. Pod ovoid-oblong, many-seeded. Spike or raceme slender.
5. HELONIAS. Flowers perfect, in a short dense raceme, lilac-purple, turning green in fruit; the divisions spatulate-oblong, spreading. Filaments slender: anthers blue. Pod 3-lobed; cells many-seeded.
6. XEROPHYLLUM. Flowers perfect, in a compact raceme, white; the divisions oval, sessile, widely spreading, naked. Filaments awl-shaped. Pod globular, 3-lobed, with 2 wingless seeds in each cell.

* * *Anthers kidney-shaped or round heart-shaped, the two cells confluent into one, shield-shaped after opening: styles awl-shaped: pod 3-horned, septicidal: seeds commonly flat or thin-margined.*

7. AMIANTHIUM. Flowers perfect, mostly in a simple raceme. Perianth white, the oval or obovate spreading divisions without claws or spots. Filaments long and slender. Seeds wingless, 1–4 in each cell. Leaves chiefly from the bulbous base of the scape-like stem, linear, keeled, grass-like.
8. STENANTHIUM. Flowers polygamous, in panicled racemes on a leafy stem. Perianth white, with spreading and not spotted lanceolate divisions tapering to a narrow point from a broader base, which coheres with the base of the ovary. Stamens very short. Seeds several, wingless. Leaves linear, keeled, grass-like.
9. VERATRUM. Flowers polygamous, in panicled racemes. Perianth greenish or brownish, its obovate-oblong divisions narrowed at base, free from the ovary, not spotted. Filaments short. Seeds rather numerous, wing-margined. Leaves broad, many-nerved. Base of the leafy stem more or less bulb-like, producing many long white roots.
10. MELANTHIUM. Flowers polygamous, in racemes forming an open pyramidal panicle. Perianth cream-colored, turning green or brownish with age, perfectly free from the ovary, its heart-shaped or oblong and partly halberd-shaped widely spreading divisions raised on a claw and marked with a pair of darker spots or glands. Filaments short, adhering to the claws of the perianth, persistent. Seeds several in each cell, broadly winged. Leaves lanceolate or linear, mostly grass-like. Stem roughish-downy above, its base more or less bulbous.
11. ZYGADENUS. Flowers pefect or polygamous, in a terminal panicle. Perianth greenish white, its oblong or ovate widely spreading divisions spotted with a pair of roundish glands or colored spots near the sessile or almost sessile base. Stamens free from and about the length of the perianth. Leaves linear, grass-like; stem and whole plant smooth.

III. BELLWORT FAMILY; with alternate and broad not grass-like parallel-veined leaves: stem from a rootstock or from fibrous roots, branching and leafy: style one at the base, but 3-cleft or 3-parted. Fruit a pod, few-seeded. Anthers turned rather outwards than inwards. Perianth of 6 almost similar and wholly separate pieces, deciduous. Not acrid nor poisonous. Plants intermediate between the preceding groups and the next.

12. UVULARIA. Flowers solitary or sometimes in pairs at the end or in the forks of the forking stem, drooping, yellowish; the perianth rather bell-shaped and lily-like, its divisions spatulate-lanceolate, with a honey-bearing groove or pit at the erect narrowed base. Stamens short, one at the base of each division: anthers linear, much longer than the filaments. Pod triangular or 3-lobed, loculicidal from the top. Seeds thick and roundish.

IV. ASPARAGUS FAMILY; with parallel-veined mostly alternate leaves, branching or simple stems from a rootstock, at least there is no bulb, a single style (if cleft or lobed at all only at the summit), and fruit a few several-seeded berry. Pedicels very often with a joint in the middle or under the flower. Flower almost always small, and white or greenish, chiefly perfect.

§ 1. *Herbs with ordinary broad leaves.*

* *Flowers bell-shaped, of 6 separate and similar deciduous divisions: stamens on the receptacle or nearly so: anthers turned outwards.*

13. CLINTONIA. Flowers erect, few or several in an umbel on a naked scape, the base of which is sheathed by the stalks of a few large oval or oblong and ciliate root-leaves. Filaments long and slender; anthers linear or oblong; style long. Ovary 2–3-celled, becoming a blue berry. Rootstocks creeping, like those of Lily-of-the-Valley, which the leaves also resemble.
14. PROSARTES. Flowers single or few, hanging at the end of the leafy spreading branches on slender simple stalks, yellowish. Divisions of the perianth lanceolate or linear. Filaments much longer than the linear-oblong blunt anthers. Ovary with a pair of hanging ovules in each of the 3 cells, becoming an ovoid or oblong and pointed red berry. Rootstock short, not creeping: herbage downy.
15. STREPTOPUS. Flowers single or rarely in pairs along the leafy and forking stem, just out of the axils of the ovate clasping leaves: the slender peduncle usually bent in the middle. Divisions of the perianth lanceolate, acute, the three inner ones keeled. Anthers arrow-shaped, on short and flattish filaments. Ovary 3-celled, making a red many-seeded berry.

* * *Flowers with perianth of one piece, but often deeply parted, the stamens on its base or tube: anthers turned inwards: stems not branched.*

16. CONVALLARIA. Flowers nodding in a one-sided raceme, on an angled scape which rises, with the about two oblong leaves, from a running rootstock. Perianth short bell-shaped, with 6 recurving lobes. Stamens included. Style stout. Ovary with several ovules, becoming a few-seeded red berry.
17. SMILACINA. Flowers in a raceme or cluster of racemes terminating a leaf-bearing stem, small, white. Perianth 6-parted, in one 4-parted. Filaments slender: anthers short. Ovary 2–3-celled, making a 1–2-seeded berry. Rootstocks mostly creeping.
18. POLYGONATUM. Flowers nodding in the axils of the leaves along a leafy and recurving simple stem, which rises from a long and thickened rootstock. Perianth greenish, cylindrical, 6-lobed or 6-toothed, bearing the 6 included stamens at or above the middle of the tube. Style slender. Ovary 3-celled with few ovules in each cell, in fruit becoming a globular black or blue few-seeded berry.

§ 2. *Plants with small scales in place of leaves, from the axils of which are produced false-leaves, i. e. bodies which by their position are seen to be of the nature of branches, but which imitate and act as leaves. Perianth greenish or whitish, 6-parted, the stamens borne on its base. Berry 3-celled, the cells 2-seeded.*

19. ASPARAGUS. Flowers greenish-yellow, bell-shaped, scattered along the much divided branches. Styles short: stigma 3-lobed. The so-called leaves very narrow.
20. MYRSIPHYLLUM. Flowers 2 or 3 in the axils, greenish-white; the linear-oblong divisions of the perianth recurved. Stamens almost as long as the perianth. Style slender: stigma entire. The so-called leaves lance-ovate. Stems twining.

V. LILY FAMILY PROPER (including Asphodel Family): distinguished by the single undivided style (or rarely a sessile stigma), and fruit a loculicidal pod. Perianth with all 6 parts generally corolla-like, and in all the following nearly similar. Leaves parallel-veined or ribbed, sometimes with netted-veins also. Stem or scape mostly simple.

§ 1. *From a coated or sometimes scaly bulb.*

* *Stem leafy, especially above, the leaves often whorled or crowded: divisions of the perianth with a honey-bearing furrow or spot at or near the base: style long: stigmas or lobes 3: pod packed with 2 rows of depressed and flat soft-coated seeds in each cell. Flowers large, often several.*

21. LILIUM. Flower bell-shaped or funnel-form with the separate or partly united divisions spreading or recurved above: the honey-bearing-groove beginning at their base. Anthers linear, at first erect, at length versatile. Pod oblong. Bulb mostly scaly (Lessons, p. 46, fig. 73, 74).
22. FRITILLARIA. Divisions of the bell-shaped flower distinct, not at all recurving; the honey-bearing spot above their base. Bulb coated or scaly. Flowers always nodding, often spotted.

* * *Stem 2-leaved or few-leaved at or towards the base, naked above and ordinarily 1-flowered at summit: the six pieces of the bell-shaped perianth separate: stamens on the receptacle or nearly so: anthers erect: seeds many, pale.*

23. TULIPA. Stem 1–2-leaved above the ground, bearing an erect large flower. Divisions of the perianth broad, not recurved nor spreading. Ovary and pod triangular, columnar: stigmas 3, sessile. Seeds nearly as in Lily.
24. ERYTHRONIUM. Scape 2-leaved from the ground, bearing a nodding flower. Divisions of the perianth lanceolate, recurved or spreading above. Ovary and pod obovate: seeds globular. Style long, more or less club-shaped.

* * * *Scape naked, bearing several or many flowers: seeds very few, globular or angled, mostly with a crustaceous or brittle black coat.*

+– *Perianth 6-parted or 6-sepalled, either wheel-shaped or less widely spreading.*

25. ORNITHOGALUM. Flowers in a corymb, bracted, white, wheel-shaped. Style 3-sided: stigma 3-angled.
26. ALLIUM. Flowers in a simple umbel, from a 1–2-leaved or scarious spathe. Style persistent, slender: stigma entire.
27. SCILLA. Flowers in a simple raceme, mostly blue. Style slender.

+– +– *Perianth merely 6-toothed or 6-cleft, bearing the short included stamens on its tube: pod triangular.*

28. MUSCARI. Flowers in a raceme; the globular or urn-shaped narrow-mouthed perianth nearly 6-toothed.
29. HYACINTHUS. Flowers in a raceme; the short-funnel-shaped or bell-shaped perianth 6-cleft, the lobes spreading.

§ 2. *Scape and leaves from a tuberous rootstock or fibrous-rooted crown: no bulb.*

* *Stamens and styles long and slender, declined: stigma nearly simple: flowers large.*

30. AGAPANTHUS. Flowers in a 2-bracted umbel, blue. Perianth tubular at base, with 6 widely spreading divisions nearly regular. Pod triangular, many seeded. Seeds flat, brownish, winged above. Leaves linear, flat.
31. FUNKIA. Flowers in a raceme, blue or white. Perianth funnel-form, 6-cleft, the lobes hardly spreading, somewhat irregular. Pod oblong, prismatic, many-seeded. Seeds flat, black, with a soft and thin coat, winged at the apex. Leaves ovate or heart-shaped, netted-veiny between the ribs, and on long petioles.
32. HEMEROCALLIS. Flowers few on a somewhat branching scape, yellow, lasting but a day. Perianth funnel-form, with short narrow tube closely investing the ovary; the nearly similar divisions more or less spreading. Pod thick, at first fleshy. Seeds few in each cell, roundish, with a hard and brittle black coat. Leaves linear, grassy, keeled.

* * *Stamens and style straight, protruding from the tubular perianth.*

33. TRITOMA. Flowers very many, nodding in a dense raceme or spike on a bracted scape. Perianth tubular, regular, red or yellow, 6-toothed. Filaments of two lengths. Pod many-seeded. Leaves narrow-linear, long and grassy, keeled, crowded at the root.

§ 3. *Stem a woody trunk, either short or tree-like, bearing a crowd of rigid and pungent-pointed sword-shaped persistent leaves: no bulb.*

32. YUCCA. Flowers in an ample terminal compound panicle, large, often polygamous, white or whitish. Perianth of 6 separate oval or oblong acute divisions, not deciduous, the 3 inner broader, longer than the stamens. Stigmas 3, sessile. Pod oblong, many-seeded; the depressed seeds as in Lily.

Among the various cultivated plants of the choicer collections, the following are not rarely met with.

* *Not bulbous.*

Phormium tènax, New Zealand Flax. Nearly hardy N., but does not flower; the very firm finely nerved linear evergreen leaves tufted on matted rootstocks, strongly keeled, conduplicate below, nearly flat above, yielding a very strong fibre for cordage.

Dracæna and **Cordyline,** Dragon-Trees, two or three species, ornaments of choice conservatories, cult. for their foliage.

Alòe angulàta, A. variegàta, and other Aloes, with very thick and fleshy 2-ranked leaves crowded or imbricated at the ground, sending up a slender scape, bearing a spike or raceme of tubular flowers; in conservatories.

* * *From coated bulbs, sending up leaves and scapes.*

Lachenália trícolor; tender bulb from Cape of Good Hope; with lanceolate soft leaves blotched with purple, and a raceme of small, rather singular than handsome, greenish-purple and yellow flowers, its erect divisions connivent, the three interior longer.

Calochórtus, Cyclobòthra, Brodiæa, and **Tritelèia,** handsome flowered bulbs, chiefly from California and Oregon, hardly any quite hardy N.

1. **TRÍLLIUM,** THREE-LEAVED NIGHTSHADE, WAKE ROBIN, BIRTHROOT. (Name from Latin *trilix*, triple, the parts throughout being in threes.) Low stem from a short tuber-like rootstock (Lessons, p. 42, fig. 67), bearing a whorl of three green conspicuously netted-veined ovate or rhomboidal leaves, and a terminal flower, in spring. All grow in rich or moist woods, or the last in bogs.

§ 1. *Flower sessile: petals and sepals narrow, the former spatulate, dull purple.*

T. séssile. From Penn. W. & S.: leaves sessile, often blotched; petals sessile, rather erect, turning greenish, long persisting.

T. recurvàtum. Only W.: differs in having the leaves narrowed at base into a petiole, sepals reflexed, and pointed petals with a narrowed base.

§ 2. *Flower raised on a peduncle: petals withering away soon after flowering.*

* *Peduncle erect or inclined: leaves rhombic-ovate, sessile by a wedge-shaped base, abruptly taper-pointed: petals flat.*

T. grandiflòrum, Great-flowered White T. From Vermont to Penn. and W., flowering rather late: handsome, the obovate petals 2′–2½′ long, much larger than the sepals, gradually recurving from an erect base, pure white, in age becoming rose-colored.

T. eréctum, Purple T. or Birthroot. Chiefly N.: not so large as the preceding; the dark dull purple petals ovate, widely spreading, little longer than the sepals, 1′–1½′ long.

Var. **álbum,** from New York W.: has greenish white, rarely yellowish petals.

Var **declinàtum,** from Ohio N. W., has peduncle fully half the length of the leaves and horizontal, or in fruit even reflexed; petals white or pinkish.

* * *Peduncle recurved from the first under the short-petioled or almost sessile leaves, not longer than the ovary and recurved white petals.*

T. cérnuum, Nodding T. Commonest E.: leaves rhombic-ovate; petals oblong, ovate, acute, ½′–¾′ long; styles separate.

T. stylòsum. Upper country S.: leaves oblong, tapering to both ends; petals oblong, tinged with rose-color, much longer and broader than the sepals; styles united at base.

* * * *Peduncle nearly erect; leaves rounded at the base and short-petioled.*

T. nivàle, Dwarf White T. From Ohio N. W.: very early-flowering, 2′–4′ high; leaves oval or ovate, obtuse; petals oblong, obtuse, pure white, 1′ long; styles slender.

T. erythrocárpum, Painted T. Low woods or bogs N.: leaves ovate, taper-pointed; petals lance-ovate, pointed, wavy, white with pink stripes at the base; berry bright red.

2. MEDÈOLA, INDIAN CUCUMBER-ROOT (from the taste of the tuberous white and horizontal rootstock; the Latin name from *Medèa*, the sorceress). Fl. early summer.

M. Virgínica, the only species: in woods: simple stem 1° – 3° high, cottony when young, bearing near the middle a whorl of 5 – 9 obovate-lanceolate thin and veiny but also parallel-ribbed leaves, and another of 3 (rarely 4 or 5) much smaller ovate ones at the top, around an umbel of a few small recurved-stalked flowers.

3. CÓLCHICUM. (Named from the country, *Colchis.*) Flowers in autumn, sends up the lanceolate root-leaves the next spring. Sparingly cult. from Eu. for ornament.

C. autumnàle, Common C., mostly with rose-purple or lilac flowers.

C. variegàtum, perhaps a variety, has shorter and wavy leaves, and perianth variegated with small purple squares, as if tessellated.

4. CHAMÆLÍRIUM, DEVIL'S BIT. (Name in Greek means *Ground Lily*, of no obvious fitness.) Fl. summer.

C. lùteum, also called Blazing-Star: low grounds, commoner W. & S.: rootstock short and abrupt, sending up a stem 1° – 3° high, bearing flat lanceolate leaves at base, some shorter ones up the stem, and a wand-like spike or raceme of small bractless flowers, the sterile ones from the stamens appearing yellow.

5. HELÒNIAS. (Name probably from the Greek for a swamp, in which the species grows.) Fl. spring.

H. bullàta. Rare and local plant, from New Jersey to E. Virginia, but sometimes cult.: very smooth, the tuberous stock producing a tuft of oblong or lance-spatulate evergreen leaves, from the centre of which rises in spring a leafless scape 1° – 2° high, bearing the rather handsome flowers.

6. XEROPHÝLLUM. (Name means, in Greek, *arid-leaved*, the narrow leaves being dry and rigid.) Fl. early summer.

X. asphodelioides. Pine barrens, from New Jersey S.: a striking plant, with the aspect of an Asphodel; simple stout stem rising 2° – 4° high from a thick or bulb-like base, densely beset at base with very long needle-shaped rigid recurving leaves, above with shorter ones, which at length are reduced to bristle-like bracts; the crowded white flowers showy.

7. AMIÁNTHIUM, FLY-POISON. (Name, from the Greek, alludes to the flowers destitute of the spots or glands of Melanthium and Zygadenus.) Flowers summer, turning greenish or purplish with age.

A. muscætóxicum, Broad-leaved F. Open woods from New Jersey S.: with a rather large bulb at the base of the stem, bearing many broadly linear ($\frac{1}{2}'$ – 1′ wide) blunt leaves; raceme dense; flowers rather large; seeds few, red and fleshy.

A. angustifòlium. Pine barrens S.: stem hardly bulbous at base, 2′ high; leaves narrow, acute, pale; seeds linear, not fleshy.

8. STENÁNTHIUM. (Name from Greek means *narrow flower.*) Fl. summer.

S. angustifòlium. Low meadows and prairies, from Penn. S. & W.: 2° – 6° high, leafy, the leaves long and narrow; flowers only $\frac{1}{4}'$ long, in a prolonged terminal and many shorter lateral racemes, making an ample light panicle.

9. VERÀTRUM, FALSE HELLEBORE. (Old name, from Latin *vere ater*, truly black.) Mostly pubescent stout herbs; the roots yield the acrid poisonous *veratrin*. Flowers summer.

V. víride, AMERICAN WHITE HELLEBORE, or INDIAN POKE. Swamps, mostly N.: stout stem 2° – 4° high, thickly beset with the broadly oval or ovate strongly plaited sheath-clasping leaves; panicle of spike-like racemes pyramidal; flowers yellowish-green turning greener with age.

V. parviflòrum, along the Alleghanies, is slender, 2° – 5° high, with scattered oval or lanceolate scarcely plaited leaves below, and a long and loose panicle of greenish small flowers turning dingy or brownish with age.

10. MELÁNTHIUM. (Name, from the Greek, means *black flower*, the perianth turning darker, yet not black.) Fl. summer.

M. Virgínicum, BUNCH-FLOWER. Moist grounds, from S. New York S. & W.: 3° – 5° high; lowest leaves sometimes 1′ wide, the upper few and small; flowers rather large.

11. ZYGADÈNUS. (Name in Greek means *yoked glands*.) Fl. summer.

Z. glabérrimus. Pine barren bogs S.: 1° – 3° high, from a running rootstock; leaves rather rigid, keeled, nerved, taper-pointed; panicle many-flowered; divisions of perianth ½′ long, a pair of round spots above the narrowed base.

Z. glaùcus. Bogs along our N. borders: 1° – 3° high, from a bulb; leaves flat, pale; flowers rather few; base of perianth coherent with that of the ovary, the divisions marked with an inversely heart-shaped spot.

12. UVULÀRIA, BELLWORT. (Name from the Latin *uvula*, or palate; the application obscure.) Stems 6′ – 2° high, naked below, leafy above: fl. spring. All in rich woods.

* *Leaves oblong, the base clasping round the stem which seems to run through the blade just above its base* (Lessons, p. 67, fig. 131): *pod 3-lobed: rootstock very short and erect.*

U. grandiflòra, the common one from W. New England W.: with pale greenish-yellow flower 1½′ long and smooth or nearly so inside.

U. perfoliàta, common E. & S.: smaller, with sharper tips to the anthers, and the parts of the barely yellowish perianth granular-roughened inside.

U. flàva, chiefly N. E., with bright yellow flower about 1′ long, and nearly smooth inside.

* * *Leaves not surrounding the stem, merely sessile: rootstock creeping: pod sharply triangular.*

U. sessilifòlia, common, especially N.: 6′ – 12′ high, with pale lance-oblong leaves, and whitish cream-colored flower ¾′ long; pod stalked.

13. CLINTÒNIA. (Named for *De Witt Clinton* of New York.) Cold moist woods: flowers early summer.

C. boreàlis. Only N. and along the mountains; flowers 2 – 7, greenish yellow, over ½′ long; berry rather many-seeded.

C. umbellàta. Along the Alleghanies; flowers numerous, ¼′ long, white speckled with green or purplish dots; seeds only 2 in each cell.

14. PROSÁRTES. (Name from Greek word meaning *hanging*.)

P. lanuginòsa. Rich woods the whole length of the Alleghany region to Canada: branches widely spreading; leaves ovate-oblong, pointed, rounded or slightly heart-shaped at the sessile base; flowers ½′ long, greenish; style with 3 stigmas: fl. late spring.

15. STRÉPTOPUS, TWISTED-STALK (which the name denotes in Greek). In cold damp or wet woods N.: flowers in late spring and early summer, small, barely ½′ long.

S. amplexifòlius. Stem stout, rough at base, 2° - 3° high; leaves strongly clasping, smooth, glaucous beneath; flower whitish, on a long stalk with abrupt bend above the middle; anthers slender-pointed; stigma truncate.

S. ròseus. Stem 1° - 2° high; leaves green, finely ciliate, and with the few branches beset with more short and fine bristly hairs; flower rose-purple, on a less bent stalk; anthers 2-horned; stigma 3-cleft.

16. CONVALLÀRIA, LILY-OF-THE-VALLEY. (Name altered from the Latin *Lilium convallium*, of which the English name is a translation.) Fl. late spring.

C. majàlis, the only true species, cult everywhere, from Europe, and wild on the higher Alleghanies; its small sweet-scented white flowers familiar.

17. SMILACÌNA, FALSE SOLOMON'S SEAL. (Name a diminutive of Smilax, which these plants do not resemble.) Wild in woods or low grounds: fl. late spring.

§ 1. *Perianth of only 4 reflexed spreading divisions: stamens 4: ovary 2-celled.*

S. bifòlia. In all moist woods N.: 3′ - 6′ high; stem bearing 2 (sometimes 3) heart-shaped leaves, and a short raceme of small flowers; berries red.

§ 2. *Perianth of 6 divisions: stamens 6: ovary 3-celled, rarely 2-celled.*

S. trifòlia. Cold bogs N.: 3′ - 6′ high, smooth, with mostly 3 oblong leaves tapering to a sheathing base; raceme loose, few-flowered; berries red.

S. stellàta. Rocky places N.: 1° - 2° high, smooth, or the 7 - 12 lance-oblong leaves minutely downy when young; raceme several-flowered; berries blackish.

S. racemòsa. Moist copses and banks, chiefly N.: 2° high, minutely downy, leafy to the top; the oblong or lance-oval leaves ciliate, pointed at each end; flowers small, crowded in a compound raceme; the divisions of perianth narrow; berries pale red and speckled.

18. POLYGONÀTUM, SOLOMON'S SEAL. (Name in Greek means *many-jointed*. The English name is from the rootstocks, the impression of the seal being the scar left by the death and separation of the stem of a former year: Lessons, p. 42, fig. 66.) Stem recurving or turned to one side. Fl. late spring and early summer.

P. biflòrum, SMALLER S. Wooded banks: 1° - 3° high; the ovate-oblong or lance-oblong leaves nearly sessile and glaucous or minutely whitish-downy beneath; peduncles mostly 2-flowered; filaments roughened, borne above the middle of the tube.

P. gigantèum, LARGER S. Alluvial grounds N.: 3° - 8° high, smooth; leaves ovate, partly clasping; peduncles 2 - 8-flowered; filaments smooth and naked, borne on the middle of the tube.

19. ASPÁRAGUS. (The ancient Greek name.) Fl. early summer.

A. officinàlis, COMMON ASPARAGUS. Cult. from Eu. for its esculent spring shoots, spontaneous about gardens: tall, bushy-branched, the leaves thread-shaped.

20. MYRSIPHÝLLUM. (The name in Greek means *myrtle-leaved*.)

M. asparagoides, of Cape Good Hope: a very smooth delicate twiner, cult. in conservatories for winter decoration, under the name of SMILAX: the bright green so-called leaves 1′ or more lóng, glossy-green both sides, nerved, set edgewise on the branch, but turning so as to present an upper and under face; the small flowers produced in winter, sweet-scented, with reddish anthers; berries green. — That the seeming leaves are of the nature of branches is shown in RUSCUS, the BUTCHER'S BROOM, of Europe (here rarely cultivated), where they are rigid, spiny-tipped, and bear flowers on one face.

21. LÍLIUM, LILY. (The classical Latin name, from the Greek.) All, including our four wild Lilies, more or less commonly cultivated: fl. summer.

§ 1. *Flowers erect, orange or orange-red, of bell-shaped outline, the divisions widely separate and on slender claws: no bulblets in the axils of the leaves. Wild species of sandy soil.*

L. Philadélphicum, Wild Orange-Red Lily. Chiefly N. & W.: 1° – 2° high, with lanceolate or lance-linear leaves nearly all in whorls of 5 – 8, and 1 – 3 open-bell-shaped reddish-orange flowers, 2½′ – 3′ long, spotted inside with dark purple.

L. Catesbæi, Southern Red L. Chiefly S.: 1° – 2° high, with scattered linear-lanceolate leaves, a solitary and larger nearly scarlet flower; the oblong-lanceolate divisions wavy-margined, recurving above, 3′ – 4′ long, with very slender claws, within crimson-spotted on a yellow ground.

§ 2. *Flowers erect, orange; the oblong divisions without claws, conniving at the broad base, the upper part spreading.*

L. bulbíferum, Bulblet-bearing L. Cult. in old gardens, from Europe: 1½° – 3° high, producing bulblets in the axils of the lanceolate irregularly scattered leaves, and few reddish-orange flowers, the divisions 2′ – 2½′ long, with some rough brownish projections at base inside, but hardly spotted.

§ 3. *Flowers nodding; the divisions without claws, rolled back, mostly dotted inside.*

* *Bulblets in the axils of the leaves.*

L. tigrìnum, Tiger Bulblet-bearing L. Cult. from China: stem 4° – 5° high, cottony; leaves lanceolate, scattered; flowers panicled, numerous, very showy, orange-red, the divisions about 4′ long, black-spotted inside.

* * *No bulblets in the axils.*

+ *Wild species of the country in moist meadows and bogs: flowers orange or orange-red, strongly dark-spotted inside.*

L. Canadénse, Canada L. Stem 2° – 5° high, bearing few or several long-peduncled flowers; leaves lanceolate, all in whorls, their edges and nerves minutely rough; divisions of the flower 2′ – 3′ long, recurved-spreading above the middle.

L. supérbum, American Turk's Cap L. Stem 3′ – 7′ high, bearing few or many flowers in a pyramidal panicle: leaves lanceolate, smooth, imperfectly whorled or many of them scattered; divisions of the flower strongly rolled backwards, about 3′ long.

L. Caroliniànum, Carolina L., in the low country S., appears to be a variety of the above, 2° – 3° high, with broader leaves and only 1 – 3 flowers more variegated with yellow.

+ + *Cultivated species from the Old World.*

L. Pompònium, Turban L., of Europe: slender, with scattered and crowded lance-linear or lance-awl-shaped leaves, and several small orange-red or scarlet (rarely white) flowers, their lanceolate acute divisions somewhat bearded inside. This and the next small-flowered, and not common in gardens.

L. Chalcedónicum, Red L. of Palestine and throughout the East; stem thickly beset with scattered narrow lance-linear erect leaves, their margins rough-pubescent; flowers several, scarlet or vermilion, the divisions bearded towards the base within, not spotted.

L. Mártagon, Turk's Cap or Martagon L., of Europe: 3° – 5° high, with lance-oblong leaves in whorls, their edges rough, and a panicle of rather small but showy light violet-purple or flesh-color (rarely white) flowers dotted with small brown-purple spots.

L. speciòsum, of Japan: stem 1° – 3° high; leaves scattered, lance-ovate or oblong, pointed, slightly petioled; flowers few, odorous, the strongly revolute divisions about 5′ long, white or pale rose-color, with prominent purple warty projections inside: now of many varieties.

L. auràtum, Golden-banded L., of Japan: stem 1° – 2° high: leaves lanceolate, scattered; flowers 1 – 3, barely nodding, sweet-scented, very large,

the ovate-lanceolate divisions 6′ or more long, spreading almost from the base and the tips revolute, white with a light yellow band down the middle of the upper face, which is spotted all over with prominent purple spots and rough with bristly projections near the base. Probably a Japanese hybrid of the preceding with some other: the most showy species known.

§ 3. *Flowers inclined, white, more or less funnel-form in outline; the naked sessile divisions conniving or somewhat united below into a tube, their summits more or less spreading, but hardly recurving. All cultivated, from Asia, with scattered leaves.*

L. cándidum, COMMON WHITE LILY. Cult. from Persia, &c.: with lanceolate leaves, and few or several bell-shaped flowers, smooth inside, sometimes double.

L. Japónicum, JAPAN WHITE L. Cult. from Japan: 2° high, with mostly only one flower, which is nodding and larger than in the foregoing, below connivent into a narrower tube, and above with the divisions more widely spreading.

L. longiflòrum, LONG-FL. WHITE L., of Japan: 1° high, with lanceolate leaves, and a single horizontal funnel-form flower, 5′ or 6′ long, the narrow tubular portion longer than the rather widely spreading portion.

22. FRITILLÀRIA. (Latin *fritillus*, a dice-box, from the shape of the flower, which differs from a Lily in its more cup-shaped outline, the divisions not spreading.) Fl. spring.

F. Meleàgris, GUINEA-HEN FLOWER. Cult. from Eu.: 1° high, with linear alternate leaves, mostly solitary terminal flower purplish, tessellated with blue and purple or whitish; the honey-bearing spot narrow.

F. imperiàlis, or PETÍLIUM IMPERIALE, CROWN IMPERIAL. Cult. from Asia: a stately herb of early spring, 3°–4° high, rather thickly beset along the middle with lanceolate or lance-oblong bright green leaves more or less in whorls; flowers several hanging in a sort of umbel under the terminal crown or tuft of leaves, large, orange yellow, or sometimes almost crimson, a round pearly gland on the base of each division; pod 6-angled.

23. TÙLIPA, TULIP. (Name and the common species said to come from Persia.) Fl. spring and early summer: all from the Old World.

T. Gesnerìana, COMMON T., from Asia Minor, is the original of the various ordinary hardy kinds; leaves lance-oblong, glaucous, shorter than the flower-stalk; divisions of the flower very obtuse.

T. suavéoleus, SWEET T. of Eu.: low; flower sweet-scented, its divisions acute, appearing very early.

24. ERYTHRÒNIUM, DOG-TOOTH-VIOLET. (Name from the Greek word for *red*, — not appropriate even for the original European species.) Fl. spring.

E. Dens-cànis, DOG-TOOTH-VIOLET of Eu: sometimes cult.; has broadly oblong pale leaves little spotted, and a rose-purple or almost white flower in earliest spring.

E. Americànum, YELLOW D. or ADDER'S-TONGUE. Moist or low woods, very common E.: leaves oblong-lanceolate, mottled and dotted with dark-purplish and whitish; flower light yellow.

E. álbidum, WHITE D. Rare in N. Y. and Penn., but common W.: leaves less or not at all spotted; flower bluish-white.

25. ORNITHÓGALUM, STAR OF BETHLEHEM. (Name in Greek means *bird's-milk*, a current expression for some marvellous thing.) Fl. early summer.

O. umbellàtum, COMMON S. or TEN-O'CLOCK, from Eu.: in old gardens and escaped into some low meadows: leaves long and grass-like; flowers bright white within, green outside, opening in the sun, on slender stalks.

26. ÁLLIUM, ONION, LEEK, GARLIC, &c. (Ancient Latin name.) Taste and odor *alliaceous.*

§ 1. *Wild species of the country, or one a naturalized weed.*

* *Leaves broad: flowers white, in summer: ovules and seeds single in each cell.*

A. tricóccum, WILD LEEK. Rich woods N.: bulbs clustered, large, pointed, sending up in spring 2 or 3 large lance-oblong flat leaves, and after they wither, in summer, a many-flowered umbel on a naked scape.

* * *Leaves linear, grass-like: ovules and seeds a pair in each cell: flowers rose-color, in summer.*

A. cérnuum, NODDING WILD ONION. Banks, through the Alleghany region and N. W.: scape angular, 1°–2° long, often nodding at the apex; pedicels of the loose many-flowered umbel drooping; flowers light rose-color; leaves linear, sharply keeled on the back, channelled.

A. mutábile, CHANGEABLE WILD O. Dry sandy soil S.: scape 1° high, terete, bearing an erect umbel of white flowers changing to rose-color; leaves narrow, concave; bulb coated with a fibrous network.

A. vineàle, FIELD or CROW GARLIC. A weed from Eu. in gardens and cult or waste low grounds; slender scape sheathed to the middle by the hollow *thread-shaped* leaves *which are grooved down the upper side*: flowers greenish-rose-color; often their place is occupied by bulblets.

* * * *Leaves narrow-linear, grass-like: ovules and seeds several in each cell: flowers nearly white, in spring.*

A. striàtum. Low pine barrens and prairies, Virginia to Illinois and S.: scape and leaves 6′–12′ high, the latter involute and striate on the back; flowers 3–10 in the umbel.

§ 2. *Cultivated from the Old World: flowers in summer.*

* *Leaves flat.*

A. Mòly, GOLDEN GARLIC. Cult. for ornament in some gardens: leaves broadly lanceolate; scape 1° high; flowers numerous, large, golden yellow.

A. satìvum, GARDEN GARLIC. Bulbs clustered, pointed; leaves lance-linear, keeled; flowers few, purple, or bulblets in their place; filaments all broad and 3-cleft.

A. Pórrum, GARDEN LEEK. Bulb elongated, single; leaves broadly linear, keeled or folded; flowers in a head, white, with some rose-colored stripes; 3 of the filaments 3-forked.

* * *Leaves cylindrical, hollow: umbel globular, many-flowered.*

A. Ascalónicum, SCHALLOTT. Bulb with oblong offsets; leaves awl-shaped; flowers lilac-purple; 3 of the filaments 3-forked.

A. Schœnóprasum, CHIVES. Low, tufted; leaves awl-shaped, equalling the scape; flowers purple-rose-color, its divisions lanceolate and pointed, long; filament simple.

A. Cèpa, ONION. Bulb depressed, large; leaves much shorter than the hollow inflated scape; flowers white, or bulblets in their place.

27. SCÍLLA, SQUILL. (The ancient name of S. MARÍTIMA of S. Europe, the bulb of which is the officinal *squill.*)

S. Fràseri, WILD S. called WILD HYACINTH at the W., QUAMASH. Moist banks and prairies from Ohio W. & S. W.: scape and linear-keeled leaves 1° high; flowers pale blue, in a long loose raceme, in spring.

S. amœna, S. vérna, &c. are cult. from Europe in some choice collections, for their early bright blue flowers, but are rare.

28. MUSCÀRI, GRAPE or GLOBE HYACINTH. (Name from the musky scent of the flowers in one species.) All from Eu.: fl. spring.

M. botryoides, COMMON GRAPE-HYACINTH, of country gardens, escaping into lawns and fields: a pretty little plant, sending up in early spring

its narrow linear leaves, and a scape (5′–7′ high) bearing a dense raceme of globular deep blue flowers which are barely ⅛′ long, resembling minute grapes, scentless.

M. racemòsum, less common in gardens, is more slender, with flaccid leaves and ovoid faintly scented flowers.

M. moschàtum, is glaucous, and has larger and ovoid-oblong livid musky-scented flowers, and linear-lanceolate shorter leaves.

M. comòsum, is larger, 9′ high, with violet-colored oblong flowers, on longer pedicels in a loose raceme, the uppermost in a tuft and abortive: the monstrous variety most cultivated produces, later in the season, from the tufted apex of the scape a large panicled mass of abortive, contorted, bright blue branchlets, of a striking and handsome appearance.

29. HYACÍNTHUS, HYACINTH. (Mythological name, the plant dedicated to the favorite of Apollo.)

H. orientàlis, Common H., of the Levant, with its raceme of blue flowers, is the parent of the numberless cultivated varieties, of divers colors, single, and double: fl. spring.

30. AGAPÁNTHUS. (Of Greek words for *amiable flower.*) One species,

A. umbellàtus. Cult. from Cape of Good Hope, a handsome house-plant, turned out blooms in summer; leaves large, bright-green, 1°–2° long; scape 1½°–2° high, bearing an umbel of pretty large blue flowers.

31. FÚNKIA. (Named for one *Funk*, a German botanist.) Ornamental, large-leaved, hardy plants, cult. from Japan and China: fl. summer. Formerly united with the Day-Lily.

F. subcordàta. White Day-Lily, is the species with long, white, and tubular-funnel-form flowers.

F. ovàta, Blue D., the one with smaller, more nodding, blue or violet flowers, abruptly expanded above the narrow tube.

32. HEMEROCÁLLIS, DAY-LILY. (Name, in Greek, means *beauty-of-a-day*, the large flower ephemeral.) Cult. from the Old World, especially in country gardens; the first species escaped into roadsides: fl. summer.

H. fúlva, Common Day-Lily. A familiar, rather coarse and tall plant, with broadish linear leaves and tawny orange flower, the inner divisions wavy and obtuse.

H. flàva, Yellow D. Less coarse, with narrower leaves and light yellow flowers, the inner divisions acute.

33. TRÍTOMA. (Name in Greek means *thrice cut*, supposed to allude to the three sharp edges of the tapering apex of the leaves, viz. the two margins and the keel.) Flowers unpleasantly-scented, showy, in autumn.

T. Uvària, from Cape of Good Hope, planted out, is ornamental in autumn, the scape rising from the thick clumps of long grassy leaves 3° or 4° high, the cylindrical spike or raceme producing a long succession of flowers, which are at first erect and coral-red, soon they hang over and change to orange and at length to greenish yellow. Roots half hardy N.

34. YÚCCA, BEAR-GRASS, SPANISH-BAYONET. (American aboriginal name.) Wild in sandy soil S., extending into Mexico, &c. Cult. for ornament, but only the nearly stemless species is really hardy N.: fl. summer, large, and whole plant of striking appearance. Under various names and varieties, the common ones mainly belong to the following:

* *Trunk short, covered with leaves, rising only a foot or two above the ground: flowering stalk scape-like: pod dry.*

Y. filamentòsa, Common Bear-Grass, or Adam's Needle. From E. Virginia S.: leaves lanceolate, 1°–2° long, spreading, moderately rigid, tipped with a weak prickly point, the smooth edges bearing thread-like filaments; scape 3°–6° high; flowers white or pale cream-color, sometimes tinged purplish.

Y. angustifòlia, wild over the plains beyond the Mississippi, is smaller, with erect and narrow linear leaves, few threads on their white margins, and yellowish-white flowers.

* * *Trunk arborescent, 2° – 8° high in wild plants on the sands of the coast S., or much higher in conservatories, naked below: no threads to the leaves.*

Y. gloriòsa. Trunk low, generally simple; leaves coriaceous, smooth edged, slender-spiny tipped, 1° – 2° long, 1′ – 1½′ wide; flowers white, or purplish-tinged outside, in a short-peduncled panicle.

Y. aloifòlia, Spanish-Bayonet. Trunk 4° – 20° high, branching when old; leaves very rigid, strongly spiny-tipped, with very rough-serrulate saw like edges, 2° or more long, 1½′ – 2′ wide; the short panicle nearly sessile.

125. JUNCACEÆ, RUSH FAMILY.

Plants with the appearance and herbage of Sedges and Grasses yet with flowers of the structure of the Lily Family, having a complete perianth of 6 parts, 3 outer and 3 inner, but greenish and glume-like. Stamens 6 or 3, style 1: stigmas 3.

1. JUNCUS. Ovary and pod 3-celled or almost 3-celled, many-seeded. Herbage smooth: stems often leafless, generally pithy.
2. LUZULA. Ovary and pod 1-celled, with 3 parietal placentæ, and one seed to each. Stems and leaves often soft-hairy.

1. JÚNCUS, RUSH, BOG-RUSH. (The classical Latin name, from the verb meaning *to join*, rushes being used for bands.) Flowers summer. — We have more than 30 species, chiefly in bogs or wet grounds, most of them difficult and little interesting to the beginner, — to be studied in the Manual and in Dr. Engelmann's monograph. The following are the commonest.

§ 1. Leafless Rushes, *with naked and jointless round stems, wholly leafless merely with sheaths at base, in tufts from matted running rootstocks: flowers in a lateral sessile panicle.* ♃

J. effùsus, Common Rush, in low grounds; has soft and pliant stems 2° – 4° high, panicle of many greenish flowers, 3 stamens, and very blunt pod.

J. filifórmis, of bogs and shores only N., is slender, pliant, 1° – 2° high with few greenish flowers, 6 stamens, and a broadly ovate blunt but short pointed pod.

J. Bálticus, of sandy shores N.; has very strong rootstocks, rigid stems 2° – 3° high, a loose panicle of larger (2″ long) and chestnut-colored with greenish flowers, 6 stamens, and oblong blunt but pointed deep-brown pod.

§ 2. Grassy-leaved Rushes, *with stems bearing grass-like flat or thread shaped (never knotty) leaves, at least near the base: panicle terminal.*

* *Flowers crowded in heads on the divisions of the panicle: stems flattened; leaves flat: stamens 3.*

J. marginàtus. Sandy wet soil, from S. New England S. & W.: 1° – 3° high; leaves long linear; heads several-flowered, brownish or purplish. ♃

J. rèpens. Miry banks S.: spreading or soon creeping, 4′ – 6′ high; leaves short linear; heads of green flowers few in a loose leafy panicle.

* * *Flowers single on the ultimate branches of the panicle, or rarely clustered: stamens 6: leaves slender.*

J. bufònius. Along all wet roadsides, &c.: stems low and slender, branching, 3′ – 9′ high; greenish flowers scattered in a loose panicle; sepals lance-linear and awl-pointed. ①

J. Gerárdi, Black Grass of salt marshes: in tufts, with rather rigid stems 1° – 2° high, and a contracted panicle of chestnut-brown but partly greenish flowers, the sepals blunt. ♃

J. ténuis. Open low grounds and fields, everywhere N.: in tufts, with wiry stems 10′–20′ high, a loose panicle shorter than the slender leaves near it, and green flowers with lanceolate very acute sepals longer than the green blunt and scarcely pointed pod. ♃

J. dichótomus. Low sandy grounds, takes the place of the preceding S.: has more thread-like leaves, flowers more one-sided on the branches of the panicle, and greenish sepals only as long as the globular and beak-pointed brownish pod. ♃

§ 3. Knotty-leaved Rushes, *the stems (often branching above) having 2–4 thread-shaped or laterally flattened leaves, which are knotty as if jointed (especially when dry) by internal cross-partitions: panicle terminal. Of these there are many species, needing close discrimination: the following are only the very commonest, especially the northern ones.* ♃

J. acuminàtus. Very wet places: 10′–30′ high; heads 3–10-flowered in a loose spreading panicle, greenish turning straw-colored or brownish; sepals lance-awl-shaped, barely as long as the triangular sharp-pointed pod; stamens 3; seeds merely acute at both ends. It flowers in early summer.

J. nodòsus. Mostly in sandy or gravelly soil: spreading by slender rootstocks which bear little tubers, 6′–15′ high; heads few, crowded, chestnut-brown, each of 8–20 flowers; sepals lance-linear and awl-pointed, hardly as long as the slender and taper-pointed pod; seeds abruptly short-pointed at both ends; stamens 6.

J. scirpoìdes. From New York S.: stems rigid, 1°–3° high from a thick rootstock; heads spherical and dense, 15–80-flowered, dull pale green; sepals rigid, awl-shaped and bristly-pointed; stamens 3; pod taper-pointed; seeds abruptly short-pointed at each end.

J. Canadénsis. Wet places, common, flowering in autumn, very variable, 1°–3° high; heads numerous, greenish or light brownish, 5–many-flowered; sepals lanceolate, the 3 outer shorter; stamens 3; seeds tail-pointed at both ends.

2. LÙZULA, WOOD-RUSH. (*Luciola* is Italian for the *glow-worm.*) ♃

L. pilòsa. Shady banks N.: 6′–9′ high; with lance-linear leaves, and chestnut-brown flowers in an umbel, in spring.

L. campéstris. Dry or moist fields and woods, 6′–12′ high, with linear leaves, and 4–12 spikes or short heads of light brown or straw-colored heads in an umbel, in spring.

126. COMMELYNACEÆ, SPIDERWORT FAMILY.

Herbs with mucilaginous juice, jointed and mostly branching leafy stems, and perfect flowers, having a perianth of usually 3 green and persistent sepals, and three ephemeral petals (these commonly melt into jelly the night after expansion); 6 stamens, some of them often imperfect, and a free 2–3-celled ovary; style and stigma one. Pod 2–3-celled, few-seeded. Not aquatic, the greater part tropical.

1. COMMELYNA. Flowers blue, irregular. Sepals unequal, 2 of them sometimes united by their contiguous margins. Two of the petals rounded and on slender claws, the odd one smaller or abortive. Stamens unequal; three of them fertile, one of these bent inwards; three smaller and with cross-shaped imperfect anthers: filaments naked. Leaves abruptly contracted and sheathing at base, the uppermost forming a spathe for the flowers.
2. TRADESCANTIA. Flowers regular. Petals all alike, ovate, sessile. The 6 stamens all with similar and good anthers, on bearded filaments.

1. COMMELỲNA, DAY-FLOWER. (There were three *Commelyns,* Dutch botanists, two of them were authors, the other published nothing. In naming this genus for them, Linnæus is understood to have designated the

two former by the full-developed petals, the latter by the smaller or abortive petal.) Ours are branching perennials, or continued by rooting from the joints; in alluvial or moist shady soil: fl. all summer.

C. eréctа. From Penn. S. & W.: stem erect, 2°–4° high; leaves lance-oblong, 3′–7′ long, the margins rough backwards, and sheaths fringed with bristles; spathes crowded, hooded, top-shaped in fruit; odd petal like the others but smaller.

C. Virgínica. From S. New York S. & W.: stems reclining and rooting at base; leaves oblong-lanceolate or narrower; spathes scattered, conduplicate, round-heart-shaped when laid open; odd petal inconspicuous.

2. TRADESCÁNTIA, SPIDERWORT. (Named for the gardener-botanist *Tradescant.*) Leaves sheathed at the base. ♃

* *Wild species of moist or rich woods, one very common in gardens: with erect stems, linear or lanceolate keeled leaves, the uppermost nearly like the others.*

+ *Umbels sessile at the end of the stem and branches between a pair of leaves, or later also in the lower axils: flowering in summer.*

T. Virgínica. Common wild from W. New York W. & S., and in gardens: leaves lance-linear, tapering regularly from the base to the point, ciliate; umbels terminal; flowers blue, in garden varieties purple or white.

T. pilòsa. Chiefly W.: 2° or more high, with zigzag stem, more or less pubescent leaves lanceolate from a narrowish base, very dense terminal and axillary umbels of smaller and later purple-blue flowers, and hairy calyx and pedicels.

+ + *Umbels one or two on a naked peduncle.*

T. ròsea. Sandy woods chiefly S. & W.: slender, 6′–12′ high, smooth, with linear grass-like leaves, and rose-colored flowers ½′ wide.

* * *Conservatory species from the tropics.*

T. zebrìna, the only one common, spreads by branching and rooting freely, rarely blossoms, is cult. for its foliage; the lance-ovate or oblong rather succulent leaves crimson beneath, and green or purplish above, variegated with two broad stripes of silvery white.

127. XYRIDACEÆ, YELLOW-EYED GRASS F.

Rush-like herbs, with equitant leaves, like Sedges, or rather Bulrushes, in having flowers in a head or spike one under each firm glume-like bract, but with a regular perianth of 3 sepals and 3 colored (yellow) petals; also a 1-celled many-seeded ovary and pod with 3 parietal placentæ, somewhat as in the Rush Family, represented by

Xyris flexuòsa, COMMON YELLOW-EYED GRASS, of sandy bogs. Scape 4′–16′ high; head roundish; lateral sepals glume-like lance-oblong, boat-shaped, wingless; the anterior one larger, membranaceous, enwrapping the corolla in the bud and deciduous with it; petals 3, with claws, alternating with 3 sterile bearded or plumose filaments and bearing on their base 3 naked filaments with linear anthers; style 3-cleft. ♃

X. Caroliniàna, the commonest of several Southern species; also N.: 1°–2° high, the scape 2-edged at top, bearing a larger head (about ½′ long), lateral sepals winged but nearly naked on the keel. ♃

X. fimbriàta, from pine barrens of New Jersey S.: 2° high, with oblong head almost 1′ long, the lateral sepals fringed on the keel. ♃

128. ERIOCAULONACEÆ, PIPEWORT FAMILY.

Another small group of marsh or aquatic herbs, of Rush-like appearance, with a head of monœcious white-bearded flowers, in structure somewhat like the Yellow-eyed Grass, terminating a naked scape, at the base of which is a tuft of grassy awl-shaped, linear, or lanceolate leaves of loose cellular texture, not equitant, but the upper surface concave.

Eriocaùlon septangulàre, in ponds or in their gravelly margins, is the common species N., with 7-angled scape 2′ – 6′ high, or more, when the water is deeper: fl. summer.

E. gnaphalòdes, with grassy awl-shaped taper-pointed leaves, in pine-barren swamps from N. Jersey S.

E. decangulàre, with similar or wider and blunt leaves, 10 – 12-ribbed scapes 1° – 3° high, and heads sometimes ½′ wide; in similar situations S.

III. GLUMACEOUS DIVISION. Flowers enclosed or subtended by glumes or husk-like bracts; no proper calyx or corolla, except sometimes minute bristles or scales which represent the perianth. Stems of the straw-like sort, called *culms.*

129. CYPERACEÆ, SEDGE FAMILY.

Some rush-like, others grass-like plants, with flowers in spikes or heads, one in the axil of each glume, the glume being a scale-like or husk-like bract. No calyx nor corolla, except some vestiges in the form of bristles or occasionally scales, or a sac which imitates a perianth; the 1-celled 1-ovuled ovary in fruit an akene. Divisions of the style 2 when the akene is flattish or lenticular, or 3, when it is usually triangular. Leaves when present very commonly 3-ranked, and their sheath a closed tube; the stem not hollow. A large family, to be studied in the Manual, &c., and too difficult for the beginner. Therefore passed over here.

None cultivated, except sparingly CYPÈRUS ESCULÉNTUS of the Mediterranean region, for its nut-like, sweet-tasted tubers, called CHUFA: only two are pernicious weeds, and that from their multiplying by similar nut-like tubers, which are hard to extirpate; these are CYPERUS PHYMATÒDES, in sandy soil, but troublesome only S.; and C. ROTÚNDUS, var. HŸDRA, the NUT-GRASS or COCO-GRASS of the South. In the genus SCIRPUS, the tall COMMON BULRUSH, S. LACÚSTRIS, or better the small one with 3-sided stems, S. PUNGENS, in the borders of ponds, is used for rush-bottomed chairs. CLADIUM EFFUSUM, with its coarse saw-edged leaves is the SAW GRASS of the South. Of Sedges proper (CAREX) there are about 160 species, several of which contribute (more in bulk than value) to the hay of low coarse meadows and half-reclaimed bogs.

130. GRAMINEÆ, GRASS FAMILY.

Grasses, known from other glumaceous plants by their 2-ranked leaves having open sheaths, the jointed stems commonly, but not always hollow, and the glumes in pairs, viz. a pair to each spikelet even when it consists of a single flower (these called *glumes* proper), and a pair to each flower (called *palets*), rarely one of them wanting. Flower, when perfect, as it more commonly is, consisting of 3 stamens (rarely 1, 2, or 6), and a pistil, with 2 styles or a 2-cleft style, and 2 either hairy or plumose-branched stigmas: ovary 1-celled, 1-ovuled, becoming a grain: the floury part is the albumen of the seed, outside of which lies the embryo (Lessons, p. 16, 17, fig. 38–42).

The real structure and arrangement of the flowers and spikelets of Grasses are much too difficult and recondite for a beginner. For their study the Manual must be used: in which the genera both of this and the Sedge Family are illustrated by plates. Here is offered merely a shorthand way of reaching the names of the commonest cultivated and meadow grasses and the cereal grains.

A. *Stems hollow, or soon becoming so.*

§ 1. *Spikelets in panicles, sometimes crowded but never so as to form a spike.*

* *Flowers monœcious, the staminate and pistillate separate in the same panicle.*

Zizánia aquática, Indian Rice or Water Oats: in water, commonest N. W.; tall and reed-like Grass, with leaves almost as large as those of Indian Corn, the upper part of the ample panicle bearing pistillate flowers on erect club-shaped pedicels, the lower bearing staminate flowers on spreading branches; each flower or spikelet with only one pair of glumes, the outer one long-awned; grain slender, ½′ long, collected for food by N. W. Indians. ①

* * *Flowers one and perfect in each spikelet, with or without rudiments of others.*

+ *Stamens 6.*

Orўza sativa, Rice. Cult. S., from Asia, in low grounds: 2°–4° high, with upper surface of the lance-linear leaves rough; branches of the panicle erect; outer glumes minute, the inner coriaceous, very much flattened laterally, so as to be strongly boat-shaped or conduplicate, closing over the grain and falling with it, the outer one commonly bearing an awn. ①

+ + *Stamens 3, or rarely fewer.*

Agróstis vulgàris, Red-top. Rather low and delicate grass of meadows and pastures, with oblong spreading panicle of small purple or purplish spikelets; the lanceolate proper glumes thin, but much firmer than the delicate palets, about the length of the outer one, the upper truncate palet one half shorter. ♃

A. álba, Fiorin or White Bent Grass. Less abundant in meadows, the stems with procumbent or creeping base; ligule long and conspicuous; panicle more dense, greenish or slightly purplish: a valuable meadow-grass. ♃

Calamagróstis Canadénsis, Blue-Joint Grass. In all bogs N., and in reclaimed low meadows, much liked by cattle: 3°–5° high; resembles an Agrostis, but taller, and with a tuft of downy long hairs around the flower almost of its length, the lower palet with a delicate awn low down on its back and scarcely stouter than the surrounding down. ♃

C. arenària, Sea Sand-Reed of beaches, where it serves a useful purpose in binding the sand by its long running rootstocks; has the panicle contracted into a long spike-like inflorescence, so that it would be sought in the next division; leaves long and strong; spikelets pale, rather rigid, the hairs at the base of the palets two thirds shorter than they. ♃

Phálaris arundinàcea, Reed Canary-Grass, the striped variety is the familiar Ribbon-Grass of country gardens; wild in bogs and low grounds; 2°-4° high, with flat leaves nearly ½′ wide, flowering in early summer, in a pretty dense contracted panicle, but open when the blossoms expand; the ovate whitish glumes longer and much thinner than the blunt coriaceous palets; a hairy rudiment or appendage at the base of each of the latter. ♃

P. Canariénsis, Canary-Grass. Cult. from Eu. for Canary-seed, and running wild in some waste places: 1°-2° high, with the panicle contracted into a sort of oblong spike, the glumes with wing-like keels, and a little scale or rudimentary sterile flower at the base of each palet. ①

* * * *Flowers several in each spikelet, all or nearly all perfect.*

+ *Reeds or Canes of the borders of rivers and ponds.* ♃

Phragmites commùnis, Common Reed, mostly N.: 5°-12° high, with leaves 1′-2′ wide, the stems dying down to the base; panicle in late summer or autumn, loose; spikelets 3-7-flowered, beset with white silky long hairs.

Arundinària macrospérma, Large Cane, forming the cane-brakes S.: with woody stems 10°-20° high and leaves 1′-2′ wide, branching the second year, at length flowering from the branches, in Feb. or March; the panicle of a few small racemes of large many-flowered naked spikelets, the palets downy.

A. técta, Smaller Reed, S., is only 4°-10° high, and more branching.

+ + *Meadow-Grasses, &c.; with awn if any terminating the glume or palet.*

Dáctylis glomeràta, Orchard-Grass. Nat. from Europe in meadows and yards: a tall and coarse but valuable grass for hay, &c, flourishes in shady places, 3° high; with broadly linear, rather rough, pale, and keeled leaves, and a dense panicle of one-sided clusters, on which the spikelets are much crowded, each 3-4-flowered, both the glumes and the laterally compressed-keeled lower palet tapering into a short awn, rough-ciliate on the keel: fl. early summer. ♃

Pòa, Meadow-Grass; several common species; known by the open panicle of 3-10-flowered spikelets, the glumes and palets blunt (no awn nor pointed tip), the latter laterally compressed and deep boat-shaped, with scarious or white membranaceous edges, and usually some delicate cobwebby hairs towards the base. Fl. summer. ♃, all but the first.

Poa ánnua, Low Spear-Grass. Very low weedy grass in cult. ground, waste places, paths, &c.: fl. in spring or again in summer. ①

P. compréssa, Wire Grass. In gravelly waste soil: pale, with low very flat stems, rising obliquely from a creeping base; panicle small.

P. seròtina, Fowl-Meadow-Grass or False Red-top: an important native grass in wet meadows N.; flowers in late summer in a loose panicle, the 2-4-flowered spikelets green with dull purple; lower palet narrow, acutish.

P. triviàlis, Roughish Meadow-Grass. A common introduced meadow and pasture grass, N.: flowering before midsummer, with open panicle of green spikelets, these mostly 3-flowered, the lower palet prominently 5-nerved; sheaths and leaves roughish; ligule oblong, acute. A white-striped variety, lately introduced, is cult. for ornament and very pretty.

P. praténsis, Common M. or westward called Kentucky Blue Grass. Dry meadows and pastures, spreading by running rootstocks, and with more crowded and often purplish panicle than the foregoing, flowering in earliest summer, the sheath smooth, and ligule short and blunt; lower palet hairy along the margins and the 5 nerves.

Festùca, Fescue Grass. Known from Poa by the firmer or even coriaceous texture of the lower palet, which is convex on the back, not cobwebby, and sometimes awn-tipped.

F. ovìna, Sheep's Fescue. Valuable pasture and lawn-grass, ½°-2° high, tufted, with slender or involute pale leaves, 3-8-flowered spikelets in a short 1-sided panicle, open in flowering, contracted afterwards, the lower palet rolled up, almost awl-shaped and tipped with a sharp point or bristle-like awn. ♃

F. elàtior, Taller Meadow Fescue. A rather rigid grass of meadows and pastures, nat. from Europe: 1° – 4° high, with green flat leaves, a narrow panicle with short branches appressed before and after flowering, 5 – 10-flowered green spikelets, the lower palet blunt, or acute, or rarely with a short awn. ♃

Bròmus, Brome Grass. Spikelets large, at length drooping in an open panicle, containing 5 – 10 or more flowers, the lower palet with a short bristle point or an awn from the blunt rounded tip or notch, the upper palet soon adhering to the grain. *Coarse grasses: two or three wild species are common, and the following are weeds of cultivation, from Europe, or the last cultivated for fodder.*

B. secàlinus, Common Chess or Cheat. Too well known in wheat-fields; nearly smooth; panicle open and spreading, even in fruit; spikelets turgid; flowers laid broadly over each other in the two ranks; lower palet convex on the back, concave within, awnless or short-awned. ① ②

B. racemòsus. Upright Chess: like the other, but with narrower erect panicle contracted in fruit, lower palet slender-awned, and sheaths sometimes hairy. ① ②

B. móllis, Soft Chess: like the preceding, but soft-downy, with denser conical-ovate spikelets, and the long-awned lower palet acute. ① ②

B. unioloìdes, or B. *Schràderi* (*Ceratóchloa unioloides*): lately much prized for fodder, may be valuable S., is rather stout and broad-leaved, with drooping large spikelets much flattened laterally, so that the lower palets are almost conduplicate and keeled on the back. ♃

Briza máxima, Large Quaking Grass or Rattlesnake-Grass, is *sometimes cult. in gardens for ornament, from Eu.: a low grass,* with the hanging many-flowered ovate-heart-shaped spikelets somewhat like those of Bromus, but pointless, very tumid, purplish, becoming dry and papery, rattling in the wind, — whence the common name. ①

+ + + *Grain and Meadow-Grasses, with a mostly twisted or bent awn on the back of the lower palet: flowers 2 or 3, or few in the spikelet, and mostly shorter than the glumes.*

++ *Flowers perfect or the uppermost rudimentary.*

Avèna sativa, Cultivated Oat, from Old World: soft and smooth, with a loose panicle of large drooping spikelets, the palets investing the grain, one flower with a long twisted awn on the back, the other awnless. ①

A. nùda, Skinless Oat, rarely cult. from Old World: has narrower roughish leaves, 3 or 4 flowers in the spikelet, and grain loose in the palets. ①

++ ++ *One flower perfect and one staminate only.*

Arrenathèrum avenàceum, Oat-Grass, or Grass-of-the-Andes. Rather coarse but soft grass, introduced from Europe into meadows and fields, and rather valuable: 2° – 4° high, with flat linear leaves, long and loose panicle, thin and very unequal glumes, including a staminate flower, the lower palet, of which bears a long bent awn below its middle, above this a perfect flower with its lower palet bristle-pointed from near the tip, and above that a rudiment of a third flower. ♃

Hólcus lanàtus, Velvet-Grass, or Meadow-Soft-Grass. Introduced from Eu. into meadows, not very common, 1½° – 2° high, well distinguished by its paleness and velvety softness, being soft downy all over; panicle crowded; the flowers only 2 in the spikelet, small, rather distant, the lower one perfect and awnless, the upper staminate and with a curved or hooked awn below the tip of its lower palet. ♃

§ 2. *Spikelets either strictly spiked or in a panicle so contracted and dense as to imitate a spike. (Here would be sought one species of* Calamagrostis *and one of* Phalaris, *for which* *see above,* p. 354, 355.*)*

* *Awn borne low down on the back of one or two palets.*

Anthoxánthum odoràtum, Sweet-scented Vernal-Grass, nat. from Eu.: the plant which gives delicious fragrance to drying hay (the other,

viz. HIERÓCHLOA BOREÀLIS, SENECA or HOLY-GRASS, being rare): low, slender, soft and smooth; the pale brown or greenish spikelets crowded in an evident spike-like panicle; each composed of a pair of thin very unequal glumes, above and within these a pair of obcordate or 2-lobed hairy empty palets, one with a bent awn from near its base, the other with a shorter awn higher up; above and within these a pair of very small smooth and roundish palets, of parchment-like texture, enclosing 2 stamens and the 2-styled pistil, finally investing the grain. ♃

Alopecùrus praténsis, MEADOW FOXTAIL. Introduced from Europe abundantly into meadows E.: flowering in spring; stem about 2° high, bearing few pale soft leaves, terminated by a cylindrical soft and dense spike, or what seems to be so, for the spikelets are really borne on short side branches, not on the main axis; these spikelets very flat contrary to the glumes, which are conduplicate, united by their edges towards the base, keeled, fringed-ciliate on the keel; these enclose a single conduplicate lower palet (the upper one wholly wanting) which bears a long awn from below the middle of the back, and surrounds 3 stamens and the pistil.

* * *Awn, if any, from the apex of the glumes or palets.*

+ *Spikelets densely crowded in a long perfectly cylindrical apparent spike, each spikelet strictly 1-flowered: glumes 2, keeled and nearly conduplicate, awn-pointed, much larger and of firmer texture than the thin and truncate awnless palets.*

Phlèum praténse, CAT-TAIL GRASS, TIMOTHY, or HERD'S GRASS; introduced from Eu.; a coarse but most valuable meadow grass, 2°–4° high, with green roughish spike 3′–8′ long; the small spikelets are crowded on very short branches, and therefore the seeming spike is not a true one. ♃

+ + *Spikelets strictly spiked all on one side of a flattened jointless rhachis, much crowded: the 2–5 spikes digitate, i. e. all on the apex of the flowering stem: palets awnless.* Finger-grass *might be sought here; see* Panicum *below.*

++ *Flower only one to each spikelet, and a mere rudiment beyond it, awnless.*

Cýnodon Dáctylon, BERMUDA or SCUTCH GRASS. An introduced weed chiefly S., where it is useful in sandy soil, where a better grass is not to be had; creeping extensively, the rigid creeping stems with short flattish leaves and sending up flowering shoots a few inches high, bearing the 3–5 slender spikes. ♃

++ ++ *Flowers 3–5 or more in each spikelet, the uppermost generally imperfect: seed loose, proportionally large, rough-wrinkled.* ①

Eleusìne Índica, CRAB-GRASS, YARD-GRASS, DOG'S-TAIL, or WIRE-GRASS. Introduced only in yards or lawns N., more abundant S., where it is valuable for cattle; low, spreading over the ground, pale; glumes and palets pointless.

Dactyloctènium Ægyptìacum, EGYPTIAN GRASS. Yards and fields, chiefly a weed, S.: creeping over the ground, low; spikes dense and thickish; glumes flattened laterally and keeled, one of them awn-pointed, the strongly keeled boat-shaped lower palet also pointed.

+ + + *Spikelets spiked alternately on opposite sides of a zigzag jointed rhachis.*

++ *Glume only one to the solitary spikelet, which stands edgewise.*

Lólium perénne, DARNEL, RYE-GRASS, or RAY GRASS. Introduced from Europe: a good pasture-grass, 1°–2° high, with loose spike 5′–6′ long, of 12 or more about 7-flowered spikelets placed edgewise, so that one row of flowers is next the glume, the other next the rhachis; lower palet short-awned or awnless.

++ *Glumes a pair to the single spikelet, right and left at each joint of the rhachis.*

Tríticum répens, COUCH-GRASS, QUITCH or QUICK-GRASS, &c., belongs to the section with perennial roots; this spreads amazingly by its vigorous long running rootstocks, is a pest in cultivated fields, and is too coarse and

hard for a meadow grass: of many varieties, introduced from Europe; spikelets 4 – 8-flowered; lower palet either pointless or short-awned. ♃

T. vulgàre, WHEAT. Spike dense, somewhat 4-sided; the spikelets crowded, 4 – 5-flowered, turgid; glumes ventricose, blunt; palet either awned or awnless; grain free. ①

T. Spélta, SPELT. A grain rarely cult. in this country; spike flat, the rhachis fragile, breaking up at the joints; grain enclosed in the palets. ①

Secàle cereàle, RYE. Tall; spike as in wheat; spikelets with only 2 perfect flowers; glumes a little distant, bristly towards the base; lower palet ventricose, long awned; grain brown.

+ + + *Glumes 6 at each joint, in front of the 3 spikelets, forming an involucre.*

Hórdeum vulgàre, COMMON BARLEY, from the Old World: spike dense, the 3 spikelets at each joint of the rhachis all with a fertile flower, its lower palet long-awned. ①

H. dístichum, TWO-ROWED BARLEY, from Tartary: only one spikelet at each joint of the rhachis with a fertile flower, the two lateral spikelets being reduced to sterile rudiments, the flowers therefore two-rowed in the spike. ①

+ + + + *Spikelets in a contracted panicle or seeming spike, or if spiked somewhat on one side of the rhachis: each with a single perfect flower, its palets of coriaceous or cartilaginous texture: by the side of it are either one or two thin palets of a sterile usually neutral flower.*

Setària, FOXTAIL-GRASS. Spikelets in clusters on the branches of the contracted spike-like panicle or seeming spike, these continued beyond them into awn-like rough bristles; but no awns from the spikelets themselves. Weeds, or the last one cult.; all from Old World; fl. late summer. ①

S. glaùca, COMMON FOXTAIL: in all stubble and cultivated grounds; low; spike tawny yellow, dense; long bristles 6 – 11 in a cluster, rough upwards (as also all the following); palets of perfect flower wrinkled crosswise.

S. víridis, GREEN FOXTAIL or BOTTLE-GRASS; has less dense and green spike, fewer bristles, and palets of perfect flower striate lengthwise.

S. Itálica, or GERMÁNICA, ITALIAN MILLET, BENGAL GRASS, &c. Cult. for fodder, 3° – 5° high, with rather large leaves, a compound or interrupted so-called spike, which is evidently a contracted panicle, sometimes 6′ – 9′ long and nodding when ripe; bristles short and few in a cluster; palets of the fertile flower smooth.

Pánicum (Digitària) sanguinàle, FINGER-GRASS or CRAB-GRASS. Chiefly a weed in cult. fields in late summer and autumn, but useful in thin grounds S. for hay; herbage reddish; spikes 4 – 15, slender, digitate, nearly 1-sided; spikelets seemingly 1-flowered with 3 glumes; no awns. ①

P. Crus-gálli, COCK'S-FOOT P., or BARNYARD-GRASS. *Common weedy grass*, of most barnyards and low rich grounds: coarse with rather broad leaves, and numerous seeming spikes along the naked summit of the flowering stems, often forming a sort of panicle; spikelets containing one fertile and one sterile flower, the lower palet of the latter bearing a coarse rough awn. ①

P capillàre, WITCH GRASS of stubble and corn-fields in autumn, having a very open capillary panicle, would be sought under another division; it is a mere weed. ①

B. *Stems not hollow, pithy.*

§ 1. *Spikelets clustered or scattered in an ample panicle, each with one perfect and one neutral or staminate flower.*

* *Without silky-down: glumes, &c. russet-brown, coriaceous.*

Sórghum vulgàre, INDIAN MILLET, DURRA, or DOURA, &c., from Africa or India; the var. CÉRNUUM, GUINEA CORN, has densely contracted panicle, and is cult. for the grain. Var. SACCHARÀTUM, SWEET SORGHUM, CHINESE SUGAR-CANE, IMPHEE, &c, cult. for the syrup of the stem; and BROOM-CORN, for the well-known corn-brooms. ①

* * *Long white silky down with the flowers.*

Sáccharum officinàrum, TRUE SUGAR-CANE: cult. far S.: rarely left to flower, propagated by cuttings; stem 8° - 20° high, 1′ - 2′ thick. ♃

Gynèrium argénteum, PAMPAS GRASS. Tall reed-like grass, from S. America, planted out for ornament; with a large tuft of rigid linear and tapering recurved-spreading leaves, several feet in length; the flowering stem 6 to 12 feet high, in autumn bearing an ample silvery-silky panicle. ♃

§ 2. *Spikelets in spikes: staminate and pistillate separate,*

* *In the same spike, the upper part of which is staminate, the lower pistillate.*

Trípsacum dactyloìdes, GAMA GRASS, SESAME GRASS. Wild in moist soil from Conn. S.: proposed for fodder S.; nutritious, but too coarse; leaves almost as large as those of Indian corn; spikes narrow, composed of a row of joints which break apart at maturity; the fertile cylindrical, the externally cartilaginous spikelets immersed in the rhachis, the sterile part thinner and flat. ♃

* * *In different spikes.*

Zèa Màys, MAIZE, INDIAN CORN. Stem terminated by the clustered slender spikes of staminate flowers (the *tassel*) in 2-flowered spikelets; the pistillate flowers in a dense and many-rowed spike borne on a short axillary branch, two flowers within each pair of glumes, but the lower one neutral, the upper pistillate, with an extremely long style, the *silk*. ①

SERIES II.

FLOWERLESS OR CRYPTOGAMOUS PLANTS:

THOSE which fructify without true flowers, that is, without stamens and pistils, and produce spores (simple cells) in place of seeds.

CLASS III. ÁCROGENS; the highest class of Flowerless Plants, those with a distinct axis, or stem, growing from the apex, containing woody matter and ducts, and bearing leaves, or something answering to leaves.

The account of the three following families is contributed by PROFESSOR DANIEL C. EATON, of Yale College. Figures of the indigenous genera are given in the Manual.

131. EQUISETACEÆ, HORSE-TAIL FAMILY.

Perennial flowerless plants, rising from creeping rootstocks; the stems mostly hollow, furrowed, many-jointed, with mere scales at the joints united into a sheath in place of leaves; either simple or with branches in whorls about the joints; fructification in terminal cone-like spikes, composed of 5-angled short-stalked and shield-shaped scales, each bearing on the under surface about 6 one-celled spore-cases. Contains but one genus.

1. **EQUISÈTUM**, HORSE-TAIL, SCOURING-RUSH. (Name from the Latin, meaning *horse-tail*.) Stems grooved, the cuticle often containing silex; each joint closed at the lower end, and bearing at the upper a tubular sheath (a whorl of united leaves) which encloses the base of the next joint, and is split into as many narrow teeth as there are ridges in the stem. Seeds (that is, *spores*) minute, each with four club-shaped threads, which are coiled about the spore when moist, but uncoil suddenly when dried. — Of 25 species, most of them widely distributed throughout the world, four or five are common with us.

§ 1. *Stems living through the winter, unbranched, or with very few branches, fruiting in summer.*

E. hyemàle, DUTCH RUSHES, SCOURING-RUSH. Common on wet banks, N.: stems solitary or 2–4 together, cylindrical, 1°–4° high, with many rough ridges; sheaths marked with one or two black rings, and divided into 15–25 narrow teeth, their points deciduous.

E. scirpoìdes. Wooded hillsides, from Penn. N.: stems in dense clusters, 3′–6′ high, not hollowed, very slender and wiry, entangled, about 6-furrowed; sheaths 3-toothed.

§ 2. *Stems annual, not living through the winter, branched, at least the sterile ones.*

E. limòsum. Muddy edges of streams, rather common: stems all alike, 2°–3° high, with many furrows, fruiting in summer, and afterwards sending out a few upright branches; sheaths with 15–20 dark-colored acute teeth.

E. arvénse, COMMON HORSE-TAIL. Moist sandy places, common N.: fertile stems unbranched, with very conspicuous sheaths, 4′–8′ high, appearing in earliest spring and soon withering; sterile stems 8′–20′ high, producing many whorls of rather rigid slender and mostly simple 4-angled branches.

E. sylváticum, WOODLAND H. Common N., along the edges of moist woods: fertile stems appearing in early spring, but lasting all summer, both these and the sterile ones producing many whorls of spreading or gracefully decurved compound softish 3–5-furrowed branches and branchlets; sheaths of the main stem loose, 8–14-toothed.

132. FILICES, FERN FAMILY.

Flowerless plants with creeping or ascending rootstocks, or even erect trunks, bearing distinct leaves (*fronds*), which are rolled up (*circinate*) in the bud (except in one group), and bear commonly on the under surface or on the edges the simple fructification, consisting of 1-celled spore-cases (technically called *sporangia*) variously grouped in dots, lines, or masses, and containing but one kind of minute, 1-celled, powdery, numerous *spores*. A large family, most abundant in warm and moist regions, consisting of 8 suborders, 6 of which are represented with us.

[*The divisions of a pinnatifid frond are properly called segments; of a pinnate frond, pinnæ; of a 2–3–4-pinnate frond, pinnules or ultimate segments. The stalk of the frond is a stipe; its continuation through the frond, the rhachis; its branches, partial or secondary rhachises. A rhachis bordered by the leafy portion becomes a midrib, which may be primary, secondary, &c.*]

I. POLYPODIACEÆ, or TRUE FERNS: characterized by stalked spore-cases, having a vertical, incomplete, many-jointed, elastic ring, which straightens at maturity, breaking open the spore-case transversely, and so discharging the spores. Spore-cases rarely if ever on very narrow thread-like branches; the fruit-dots often covered by a scale-like involucre (the *indusium*).

§ 1. *No definite fruit-dots, but the spore-cases in large patches on the under surface of the fertile frond, or entirely covering the under surface: no indusium.*

1. ACROSTICHUM § CHRYSODIUM. Fronds simple or pinnately branched, with reticulated veins: spore-cases covering the whole under surface of the frond or of its upper divisions.
2. PLATYCERIUM. Fronds irregularly forking; veins reticulated: spore-cases in large patches on special portions of the under surface.

§ 2. *Spore-cases on the back of the frond, sometimes near the margin, in dots or lines (sori) placed on the veins or at the ends of the veins, but without indusium of any kind.*

3. POLYPODIUM. Fronds simple or pinnate, rarely twice pinnate; veins free or reticulated; fruit-dots round or roundish, at the ends of the veins, or at the point where several veins meet (*anastomose*). Stalk articulated to the rootstock, and leaving a distinct scar when decayed away.

14. PHEGOPTERIS. Agrees with Polypodium in most respects; but has the fruit-dots smaller, and commonly on the veins, not at their ends, and the stalk is not articulated to the rhachis.

4. GYMNOGRAMME § CEROPTERIS. Fronds compound, covered beneath with white or yellow waxy powder: fruit-dots in long often forking lines on the veins.

5. NOTHOLÆNA. Fronds once or twice pinnate, woolly, scaly or powdery beneath; fruit-dots at the ends of the veins, forming a line next the margin of the divisions.

§ 3. *Spore-cases on the back along the margin of the frond, provided with an involucre formed of its reflexed and more or less altered margin.*

6. ADIANTUM. Fruit-dots at the ends of the veins, borne on the inner side of a reflexed portion of the margin. Stalk dark and polished, sometimes chaffy-bristly. Pinnules always separate, distinctly stalked or almost sessile, but never decurrent on the rhachis.

7. PTERIS. Spore-cases on a transverse veinlike receptacle within the margin, which connects the ends of the veins, and is covered by the reflexed thin margin. Stalk light-colored (except in § Doryopteris.) Pinnules or ultimate segments adnate to the rhachis, often decurrent.

8. PELLÆA. Spore-cases in short lines on the upper part of the veins, confluent in a sub-marginal band of fructification, white within, more or less covered by the reflexed and commonly thin margin. Stalk dark and polished, sometimes chaffy. Pinnules mostly distinct, sessile or nearly so.

§ 4. *Fruit-dots oblong or linear, on transverse reticulating veinlets, in rows near the midrib and parallel to it: indusium of the same shape as the fruit-dot, opening toward the midrib and attached by the outer edge to the fruitful cross-veinlet.*

9. WOODWARDIA. Fruit-dots straight, oblong-linear, in chain-like rows, partly sunken in shallow cavities of the under surface of the frond. Rather large, native. Veins reticulated, often very much so.

10. DOODIA. Fruit-dots oblong, often slightly crescent-shaped, not sunken in the frond. Exotics; the narrow fronds pinnatifid or simply pinnate.

§ 5. *Fruit-dots oblong or linear, on one or both sides of oblique veinlets, with involucres of like shape attached by one edge to the veinlet and free along the other.*

11. ASPLENIUM. Fruit-dots single and placed on the upper side of the veinlets, rarely double and set back to back on both sides of the same veinlet. Veins mostly free.

12. SCOLOPENDRIUM. Fruit-dots linear, elongated, double and placed face to face along contiguous veinlets; each pair thus seeming to be a single one with an indusium opening along the middle. Frond simple, ribbon-shaped or tongue-shaped, with free forking veins.

13. CAMPTOSORUS. Fruit-dots various, mostly short; those near the midrib double as in the last; the outer ones angled, curved or straight, simple as in Asplenium. Frond simple, tapering to a long and narrow usually rooting point. Veins reticulated.

§ 6. *Fruit-dots on the back of the veins, rarely at the ends, round or roundish, covered at least when young by a special indusium of the same general shape. Sterile and fertile fronds alike or nearly so.*

15. ASPIDIUM. Indusium flat, round or kidney-shaped, fixed at or near the centre, opening all round the edge. Mostly rather large Ferns, from once to thrice pinnate. Veins free in the native species.

16. CYSTOPTERIS. Indusium convex, fixed by the base partly under the fruit-dot, its length reflexed. Small Ferns, with delicate twice or thrice pinnate fronds. Veins free.

§ *Sterile fronds broad and leafy: fertile ones with contracted and rolled up and pod-like or berry-like divisions: indusium very obscure, irregularly semicircular, placed at the base of a short receptacle to which the spore-cases are attached.*

17. STRUTHIOPTERIS. Sterile fronds tall, with free veins, growing in a crown; fertile fronds coming up much later in an inner circle, pinnate, each pinna rolled up from the edges into a somewhat cylindrical or necklace-like body, containing the fruit.

8. ONOCLEA. Fronds scattered on a long creeping rootstock: sterile ones with reticulated veins; fertile ones twice pinnate, the divisions contracted, rolled up and berry-like.

§ 8. *Involucres star-shaped, with broad and ragged or else capillary and jointed rays, placed on the veins under the round fruit-dots, sometimes at first enveloping the spore-cases.*

9. WOODSIA. Small Ferns, often growing in dense tufts: fronds once or twice-pinnate: veins forked, free.

§ 9. *Fruit-dots separate or laterally confluent at or near the margin of the frond, borne on the ends of the veins, or on the ends of very short side-veinlets: the indusium attached at the base or base and sides, and opening toward the margin of the fruitful portion of the frond.*

20. DAVALLIA. Indusium of a single piece, flattish or often convex and shaped like half a goblet cut lengthwise. Exotic Ferns, mostly decompound.
21. DICKSONIA. Indusium united by its sides with a little lobe or tooth of the frond, forming a minute 2-lipped cup, at first nearly or quite closed, opening as the spore-cases ripen. Large Ferns, native or exotic, some of the latter arborescent.

II. CYATHEACEÆ, or TREE FERNS: with erect and tree-like stems, often many feet high. Fruit-dots round, not marginal, naked, or with an involucre placed beneath the stalked spore-cases, which are seated on a globose or elevated receptacle, have a somewhat oblique complete ring, and burst open transversely.

22. CYATHEA. Fruit-dots on a vein or in the forking of a vein, at first enclosed in a globose involucre, which opens at the top, and remains cup-shaped with an entire or broken edge.
23. ALSOPHILA. Fruit-dots as on the last, but entirely naked, or with a rudimentary indusium consisting of a minute scale beneath the spore-cases: veins free.

III. HYMENOPHYLLACEÆ, or FILMY FERNS: these have very delicate and translucent fronds, the short-pedicelled spore-cases growing on a short or long thread-like receptacle, included in a goblet-shaped or 2-lipped involucre, and furnished with a complete transverse or slightly oblique ring.

24. TRICHOMANES. Fruit-dots marginal, at the end of a vein, which extends through the funnel-form or goblet-shaped involucre, as a thread-like receptacle bearing the spore-cases; involucres sunken more or less in the frond, and of the same pellucid texture.

IV. SCHIZÆACEÆ: mostly small Ferns, or else with climbing fronds. Spore-cases ovate, sessile, having a complete transverse, articulated ring or cap at the apex, and opening by a longitudinal slit.

* *Ferns with elegant climbing fronds, rising from slender creeping rootstocks: spore-cases fixed by their side.*

25. LYGODIUM. Pinnæ or frondlets in pairs. Spore-cases covered by imbricating scale-like indusia in a double row on narrow lobes of the frond.

* * *Not climbing: rootstock short: fronds clustered: spore-cases fixed by their base: no indusium.*

26. ANEIMIA. Spore-cases on the narrow panicled branches of the lowest pair of pinnæ of the 1–3 pinnate frond, or on separate fronds.
27. SCHIZÆA. Spore-cases in a double row on the narrow divisions of a pinnate or rarely pedate special appendage to the simple and linear, or fan-shaped, and sometimes many-forked frond.

V. OSMUNDACEÆ, or FLOWERING FERNS: rather large Ferns; the spore-cases covered with reticulated ridges, opening longitudinally into two valves, and with no ring, or a mere vestige of a transverse ring at the back.

28. OSMUNDA. Rootstock very thick, creeping, the growing end producing a crown of tall showy fronds. Fertile fronds or parts of fronds contracted, pinnately compound, the narrow often thread-like divisions densely covered with nearly sessile spore-cases.

VI. OPHIOGLOSSACEÆ, the ADDER'S-TONGUE FAMILY: mostly rather small ferns, with sessile, globular, coriaceous opaque and smooth spore-cases, opening transversely into 2 valves, and wholly destitute of a ring. Fronds not rolled up in the bud, as they are in all the foregoing, rising from a very short rootstock or corm, with fleshy roots.

29. BOTRYCHIUM. Spore-cases in pinnate or compound spikes, distinct. Sterile part of the frond compound; veins free.

30. OPHIOGLOSSUM. Spore-cases cohering in a simple spike. Sterile part of frond simple in our species; the veins reticulated.

1. ACRÓSTICHUM § CHRYSÒDIUM. (From Greek words meaning *a row at the top*, the application not evident.) All tropical.

A. aùreum. A large evergreen Fern, along the coast of South Florida; the fronds simply pinnate, coriaceous; pinnæ 4′ – 6′ long, 1′ – 2′ wide, elliptical or oblong-linear.

2. PLATYCÈRIUM, STAG-HORN FERN. (Name from the Greek, meaning *broad horns*.) Natives of Africa, Australia, &c.: cult. in conservatories.

P. alcicórne. Sterile fronds sessile, rather thin, flat and rounded, overlapping each other; fertile ones erect, 1° high, whitish and minutely downy beneath, 2 – 3 times forked, with divisions about 1′ wide, the topmost ones fruitful.

3. POLYPÒDIUM, POLYPODY. (Name in Greek means *many-footed*, referring to the branching rootstock.) An immense genus, found in all parts of the world.

§ 1. POLYPODIUM proper. *Veins free: the following all native.*

P. vulgàre, COMMON POLYPODY. Rocky places N., small, simply pinnatifid, evergreen, smooth both sides, 4′ – 10′ high, 1′ – 3′ wide, the numerous divisions oblong-linear; fruit-dots rather large.

P. incànum. Shady places S., often on trees; much like the last, but much smaller, and beneath grayish and scurfy with peltate scales; fruit-dots rather small.

§ 2. CAMPYLONEURON. *Veins parallel, pinnate from the midrib, connected by numerous transverse angularly arched veinlets, with short fruit-bearing veinlets proceeding from the angles.*

P. Phyllitidis, HARTS-TONGUE, of Tropical America; frond simple, linear-lanceolate, 1° – 1½° long, 1′ – 2′ wide, thinly chartaceous, smooth and shining; fruit-dots in 2 rows between the veins.

§ 3. NIPHÓBOLUS. *Veins much as in the preceding, but very obscure and closely reticulated. Fronds simple, of a thickish texture, covered on both sides with a close stellate down.*

P. Língua. Cult. from Japan: fronds 4′ – 8′ long, ovate-oblong or lanceolate, entire, at length nearly smooth above; fruit-dots exceedingly numerous, closely arranged in many rows.

§ 4. PHLEBÒDIUM. *Veins reticulated, with free veinlets included in the larger meshes. Fruit-dots in 1 – 3 rows between the midrib and margin, commonly placed each one on the converging ends of a pair of veinlets.*

P. aùreum. A large showy Fern of Florida, and cult. from West Indies; fronds on a stout stalk, broadly ovate in outline, smooth, pale green above, glaucous beneath, pinnately parted into 5 – 9 or more oblong-linear or lanceolate spreading divisions.

4. GYMNOGRÁMME. (Name meaning in Greek a *naked line*, from the elongated fruit-dots.) The following cult. species all have free veins, and the under surface of the fronds covered with a yellow or whitish waxy powder.

G. triangulàris, CALIFORNIAN GOLD-FERN. Deserves more general cultivation; frond 4′–6′ long, on slender and polished stalks, broadly 3- or rather 5-angled in outline, twice pinnate below, pinnate above; pinnæ oblong-lanceolate, deeply pinnatifid into obtuse lobes. Smooth and green above, beneath of a rich golden yellow, sometimes paler; the fertile fronds at length nearly covered with brownish lines of spore-cases.

G. sulphùrea, of West Indies: fronds narrowly lanceolate in outline, 1°–1½° high, 2′–3′ wide, pinnate; pinnæ ovate or ovate-oblong, lower ones gradually smaller and very remote, pinnatifid into ovate obtuse toothed or ragged lobes, the lower surface covered with sulphur-yellow powder.

G. calomélanos, from Tropical America, the commonest Gold and Silver ferns of the conservatories; much like the last, but broader and larger, the lower pinnæ largest, and lobes mostly acute. The powder white, or in var. CHRYSOPHÝLLA golden yellow.

5. NOTHOLÆNA. (Name from the Greek, signifying *spurious wool*, the woolly pubescence of some species concealing the marginal fruit-dots.) The following cult. species are small, 4′–8′ high, ovate in outline, mostly tripinnate; their ultimate divisions roundish-ovate or oblong, distinct, stalked, and covered beneath with a waxy powder: stalk and branches dark brown and polished.

N. flàvens, from Central America: powder bright yellow; fruit-dots extending from the edge almost to the midrib, so that it might equally well be considered a Gymnogramme.

N. nívea. Also Central American, and very like the other; but the powder snowy white, and the fruit-dots closer to the margin.

6. ADIÁNTUM, MAIDEN-HAIR. (Name from the Greek, meaning *unwetted*, the rain-drops not adhering to the fronds.) A large genus, most abundant in warm climates.

* *Frond simply pinnate: exotic.*

A. macrophýllum. Cult. in hot-houses from West Indies; pinnæ 2–5 pairs and a terminal one, nearly sessile, deltoid-ovate, 2′–3′ long, nearly half as wide; fructification in long marginal rarely interrupted lines. Pinnæ of sterile fronds wider and somewhat crenately incised and toothed.

* * *Frond 2–4 times pinnate, ovate-lanceolate in general outline.*

A. Capíllus-Véneris, VENUS-HAIR, so named from the shining capillary branches of the rhachis; native S., often in conservatories N.: twice pinnate or thrice pinnate at the base, the long upper part simply pinnate; pinnules about ½′ broad, on very slender stalks, sharply wedge-shaped at the base, rounded at the top, or rhomboidal, commonly deeply lobed from the upper margin; fruit-dots one to each lobe; involucres kidney-shaped or transversely oblong. Plant 6′–12′ high, often pendent from damp shaded rocks in the mouths of wells, &c., in S. of Europe.

A. Æthiópicum, as commonly seen in hot-houses, is much like the last; but has smaller pinnules not so sharply wedge-shaped, often broader than long, and less deeply lobed; fruit-dots in deep sinuses of the upper margin; involucres kidney-shaped or crescent-shaped.

A. cuneàtum, from S. America, is a much larger plant, broadly triangular in outline, 3–4 times pinnate; pinnules smaller and véry numerous, wedge-shaped at the base, the upper edge deeply lobed; fruit-dots as in the last.

* * * *Frond two-forked, with elongated simply pinnate divisions springing from the upper side of the two recurved branches: midrib of the pinnules none: veins forked from the base.*

A. pedàtum, MAIDEN-HAIR. Native in shady woods; whole plant smooth, 1°–2° high; principal divisions 4′–10′ long, 1′–1½′ wide; pinnules very

numerous, oblong, broadest at the base, obtuse, lobed from the upper edge; fruit-dots at the top of the lobes; involucres transversely oblong or linear.

A. hispídulum, from Australia, &c.: commonly less symmetrical than the last, when young irregularly 3–4-branched; a smaller plant with finely chaffy or bristly stalk and rhachis; pinnules minutely hairy, nearly entire; fruit-dots crowded along the upper margin, involucres rounded kidney-shaped.

7. PTÈRIS, BRAKE. (The ancient Greek name for Ferns, meaning *a wing*, from the feather-like fronds.) Another large and widely distributed genus.

§ 1. *Veins free: stalk straw-colored or brownish.*

* *Frond simply pinnate: pinnæ undivided.*

P. longifòlia. Cult. from warm regions, native in S. Florida: oblong-lanceolate in outline; pinnæ numerous, linear and tapering from a truncate or cordate base, the upper and lower ones gradually smaller.

* * *Frond pinnate, and with the lower pairs of pinnæ forked or again pinnate, the divisions and upper pinnæ elongated, simple.*

P. Crètica. Cult. from warm climates, native in Florida: 1°–2° high; pinnæ 1–4 pairs, the upper ones slightly decurrent, lower ones cleft almost to the base into 2–3 long linear-lanceolate acuminate divisions; sterile ones and tips of the narrower fertile ones finely and sharply serrate. Var. ALBO-LINEATA has a whitish stripe in the middle of each division.

P. serrulàta. Cult. from China: 1°–1½° high; pinnæ 3–8 pairs, all but the lowest decurrent and forming a wing 3″ wide on the main rhachis; lower pairs pinnately or pedately cut into several narrow linear-acuminate divisions; upper ones simple, sterile ones spinulose-serrulate.

* * * *Fronds pinnate, and the numerous primary divisions pinnately cut into many lobes, the lowest ones mostly with 1–3 elongated similarly-lobed branches on the lower side.*

P. quadriaurìta. Cult. from East or West Indies, &c.: fronds 1°–3° long, 6′–12′ wide, broadly ovate in outline; lobes of primary divisions linear-oblong, ½′–1′ long, 3″ wide, very numerous and often crowded, mostly rather obtuse. Var. ARGÝREA, has a band of white along the middle of the primary divisions; to this is added a tinge of red in var. TRÍCOLOR.

* * * * *Fronds broadly triangular, twice or thrice pinnate throughout: lowest primary divisions long-stalked.*

P. aquilìna, COMMON BRAKE. Plentiful everywhere, 1°–5° high, harsh to the touch; the lowest primary divisions standing obliquely forward; secondary divisions pinnatifid with many oblong or linear sometimes hastate lobes, which in a fruiting frond are bordered everywhere with brown spore-cases.

§ 2. DORYÓPTERIS. *Veins finely reticulated: frond pedate, and 5-angled: stalk black and shining.*

P. pedàta. Cult. from West Indies and S. America: frond 2′–6′ long and nearly as wide, almost parted into a few primary divisions; upper ones entire, lowest pair again cleft; the lobes on the lower side much largest.

8. PELLÆA, CLIFF-BRAKE. (Name from the Greek, meaning *dark-colored*, descriptive of the stalk.) Mostly small Ferns: the following species have fronds of a somewhat coriaceous texture.

P. rotundifòlia, from New Zealand: frond narrow, 6′–12′ long, on a chaffy and pubescent wiry stalk, simply pinnate; pinnæ round or roundish-oblong and entire; band of spore-cases very wide and concealing the narrow involucre.

P. atropurpùrea. Wild, on shaded limerock: fronds tufted, 6′–12′ long, 2′–4′ wide, with polished and sparingly downy stalks, 2-pinnate, simply pinnate toward the top; pinnules distinct, oblong or linear-oblong, rarely halberd-shaped, obtuse or slightly mucronate; involucre rather broad, and at length hidden by the spore-cases.

P. hastàta, from South Africa: mostly larger than the last and very variable: frond ovate-lanceolate or oblong, 1–3-pinnate; pinnules lanceolate or

rhomboid-ovate, very often halberd-shaped, the end ones of the primary pinnæ much the largest, often 1′–2′ long and ½′–1′ broad; stalk and branches black and polished, smooth; involucre rather narrow.

9. WOODWÁRDIA, CHAIN-FERN. (Named in honor of *Thomas J. Woodward*, an English botanist of the last century.) A small genus of rather large Ferns, all natives of the N. temperate zone.

W. Virgínica. Tall, growing in swamps N. & S.: sterile and fertile fronds alike, ovate in outline, pinnate, with lanceolate deeply pinnatifid pinnæ; lobes oblong, obtuse; veins reticulated, forming a single row of meshes along the midribs of pinnæ and of lobes, the outer veinlets free; fruit-dots oblong, close to the midribs.

W. angustifòlia. Range, &c. of the last, but less common: fronds 6′–10′ long, 4′–6′ broad, pinnatifid almost to the winged rhachis into 17–27 lobes, which are broadly lanceolate and with copiously reticulated veins in the sterile frond, but are narrowly linear in the fertile, and with a single row of narrow meshes next the midrib; fruit-dots linear, sausage-shaped, one in each mesh.

10. DOÒDIA. (Named in honor of *Samuel Doody*, an early English Cryptogamic botanist.) Small Ferns, cult. from Australia and New Zealand.

D. caudàta. Fronds 9′–15′ long, linear-lanceolate, on dull-black nearly smooth stalks, pinnate with many linear serrate and nearly sessile pinnæ, which are about 1′ long, often slightly auriculate at base, the lower ones rather triangular, distant; fruit-dots in a single row next the midrib.

D. áspera. Stalk black and rough with small ragged points; fronds broadly lanceolate, rather coriaceous, harsh to the touch, pinnatifid to the rhachis; divisions crowded, oblong-linear, spinulose-serrate, lower ones gradually smaller; fruit-dots not close to the midrib, sometimes a second row next the margin.

11. ASPLÈNIUM, SPLEENWORT. (Name from the Greek; refers to supposed action on the spleen.) A very large genus, the size of the species ranging from quite small up to very large and even tree-like.

§ 1. *Fronds undivided, large and showy: cult. from East Indies, &c.*

A. Nìdus, BIRD'S-NEST FERN. Fronds numerous, broadly lanceolate, 2°–4° long, 4′–8′ wide, entire, short-stalked, arranged in a crown around the central upright rootstock; fruit-dots very narrow, elongated, crowded, running from the stout midrib obliquely half-way to the margin.

§ 2. *Fronds small, pinnatifid below, tapering into a long entire point: native.*

A. pinnatífidum. Very rare, near Philadelphia, and sparingly W. & S., especially along the Alleghanies: fronds 3′–6′ long, ½″–1¼′ wide at the base; lobes roundish-ovate mostly obtuse; fruit-dots small, irregular.

§ 3. *Fronds simply pinnate.*

* *Small Ferns, 4′–15′ high: all except the last are wild species.*

A. Trichómanes. Common, forming dense tufts in crevices of shady rocks: fronds linear, 4′–8′ long, with black and shining stalk and rhachis, and many roundish or oblong slightly crenated or entire pinnæ, about ¼′ long and about half as broad; fruit-dots few to each pinna.

A. ebèneum. Common in rocky woods: fronds linear-lanceolate, narrower at the base, 8′–15′ long, 1′–2′ wide; stalk dark and polished; pinnæ many, linear-oblong, often slightly curved, finely serrate, auricled on one or both sides at the base; fruit-dots numerous.

A. flabellifòlium. Cult. from Australia: lax, the rhachis often prolonged and rooting at the very end; fronds linear; pinnæ sharply wedge-shaped at the base, the broad and rounded end crenated; fruit-dots irregularly radiating from the base of the pinnæ.

* * *Large Ferns, 1°–3° high.*

A. angustifòlium. Rich woods N., and S., mainly along the mountains: fronds thin, long-lanceolate, pinnæ many 3′–4′ long, linear-lanceolate from a

truncate or rounded base, acuminate, nearly entire; those of the fertile frond narrower; fruit-dots slightly curved, very numerous.

§ 4. *Fronds more than once pinnate.*

* *Fruit-dots more than one in each smallest division of the frond.*

A. Rùta-murària, Wall-Rue. On exposed cliffs of limestone, from Vermont W. & S.: fronds small, 1′–4′ long, ovate, twice or thrice pinnate, the few divisions rather thickish, wedge-shaped or rhomboid, toothed at the top; fruit-dots few, becoming confluent.

A. furcàtum. Cult. from Trop. America, S. Africa, &c.: fronds 8′–15′ long, 3′–6′ wide, on a somewhat hairy stalk, ovate-lanceolate, pinnate with lance-oblong acuminate pinnæ, which are again pinnately cut nearly or quite to the midrib; divisions oblique, wedge-shaped, narrow, serrate, rather coriaceous, deeply marked by the forking veins; fruit-dots elongated, radiating from the base of the division.

A. thelypteroides. In rich rocky woods, not rare: fronds 1½°–3° high, thin in texture, broadly lanceolate, pinnate; pinnæ 3′–6′ long, lanceolate, deeply pinnatifid into close-set oblong and obtuse minutely toothed lobes; fruit-dots 6–12 to each lobe, some of them commonly double.

A. Filix-fœmina, Lady-Fern. Common in moist woods: fronds large (2°–3° high, 4′–8′ broad), growing like the last in a crown, 2–3-pinnate; pinnæ lanceolate, with a narrow border to the secondary rhachis: pinnules oblong and sharply serrate, or in larger plants lanceolate and pinnatifid with incised lobes; fruit-dots short, variously curved, at length confluent.

* * *Smallest divisions of the frond narrow, entire, containing but a single veinlet and but one fruit-dot.*

A. Belángeri. Cult. from Malacca and Java: fronds 1°–1½° high, 2′–3′ wide, coriaceous, pale green, as is the stoutish stalk; pinnæ oblong, truncate at the base, with a rounded apex, pinnatifid to the winged midrib into numerous narrowly oblong and obtuse lobes, the upper basal ones of each pinna 2–3-cleft, the rest entire and bearing on the side farthest from the main rhachis a solitary elongated fruit-dot.

A. myriophýllum. Limestone caves in Jackson Co., Florida: fronds delicate, almost translucent, lanceolate, 6′–9′ long, 1′–2′ wide, 2–3-pinnate; smallest divisions obovate-oblong, 2″–3″ long, ½″ wide; fruit-dot in the lower half of each division.

A. bulbíferum. Cult. from New Zealand, &c: fronds herbaceous, ample, broadly lanceolate, 1°–3° long, 6′–12′ wide, 2–3-pinnate, often producing leafy bulbs on the upper surface; pinnæ triangular-lanceolate, with a broadly winged midrib; pinnules lanceolate, deeply toothed or cut into oblong-linear lobes; fruit-dots extending from the middle of the lobes downward almost to the midrib of the pinnules.

12. SCOLOPÉNDRIUM. (Name from the Greek word for a *centipede*, suggested by the many oblique lines of fruit each side of the midrib.)

S. vulgàre, Hart's-tongue. Rare, among shaded rocks in Central New York and in Canada West; fronds 6′–18′ long, 1′–2′ wide, oblong-lanceolate from a heart-shaped base, herbaceous, the margin entire or wavy. Cultivated forms from England are crisped, crested, many-forked, &c.

13. CAMPTOSÒRUS, WALKING-LEAF. (Name from the Greek, meaning a *bent heap*, referring to the curved and angled fruit-dots.) Almost the only species is

C. rhizophýllus. Damp mossy rocks N. & S., mainly along the mountains: frond 4′–12′ long, tapering from a heart-shaped or auricled base 6″–12″ wide to a long narrow point, which *often roots at the end, and there gives rise to a new plant ready to take another step in advance.*

14. PHEGÓPTERIS, BEECH-FERN (which the name means in Greek, the original species often found among beeches). Chiefly tropical; but the following are all wild species, in rocky or shady woods.

* *Fronds twice pinnatifid: the sessile pinnæ mostly forming an irregular and many-angled wing along the rhachis.*

P. polypodioìdes, formerly POLYPÓDIUM PHEGÒPTERIS. Common N.: fronds 4′–9′ long, longer than broad, triangular-ovate, slightly hairy beneath; pinnæ lanceolate, the lower pair turned obliquely forwards; secondary divisions crowded, oblong, obtuse, entire; fruit-dots all near the margin.

P. hexagonóptera. Common N. & S.: larger than the last, which it much resembles, but the frond is broader than long; lowest pinnæ much the largest and with elongated and pinnatifid divisions; fruit-dots not exclusively near the margin.

* * *Fronds with three primary divisions, which are stalked, rhachis wingless.*

P. Dryópteris. Common N.: fronds broadly triangular, 4′–6′ wide, smooth; the three primary divisions triangular, once or twice pinnate with oblong obtuse entire or toothed lobes; fruit-dots near the margin.

15. ASPÍDIUM, SHIELD-FERN. (Greek for a *little shield*, referring to the indusium.) — A very large genus, inhabiting all parts of the world.

§ 1. NEPHRÒDIUM or DRYÓPTERIS. *Indusium round-kidney-shaped or nearly circular with a narrow cleft from the lower side almost to the centre.*

* *Fronds thickish, simply pinnate, the few pinnæ entire or nearly so.*

A. Siebòldii. Cult. from Japan: fronds coriaceous, smooth, about 1° high, with 2–4 pairs of side pinnæ, each 4′–6′ long and nearly 1′ wide, and a terminal one rather larger than the others; veins with 4–6 free parallel branches; fruit-dots large, scattered in several rows.

* * *Fronds thin, decaying in early autumn (or tender hot-house plants), pinnate: pinnæ simply pinnatifid with mostly entire obtuse lobes: indusium small.*

+ *Rootstock creeping, slender, nearly naked and bearing scattered fronds: veins free, simple or once forked: wild species, common in bogs and low grounds.*

A. Thelýpteris. Fronds lanceolate, 10′–18′ long, on slender stalks, nearly smooth; pinnæ lanceolate, 2′–4′ long, about ½′ wide, spreading or turned down, the lowest pair scarcely shorter; divisions oblong, fruiting ones seeming acute from the revolute margins; veins mostly forked; fruit-dots confluent when ripe; indusium smooth.

A. Noveboracénse. Much like the last, but hairy beneath along the rhachis and veins; fronds tapering both ways from the middle; lower pinnæ gradually smaller and distant; lobes flat, the basal ones often larger and incised; veins rarely forked; fruit-dots distinct; indusium slightly glandular.

+ + *Rootstock oblique or erect, stouter, bearing the fronds in a crown: veins simple, free, or the lower ones of contiguous lobes united: indusium hairy.*

A. pàtens. Low shady grounds, Florida and W.: fronds 1°–2° high, sparsely pubescent, ovate-oblong; pinnæ 3′–6′ long, ½′ wide, numerous, lanceolate from a broad base, lowest pairs a little smaller; divisions oblong, slightly falcate, obtuse or acutish; veins entirely free; indusium slightly hairy.

A. mólle. Cult. from tropical countries: very much like the last, but everywhere downy or soft-hairy; pinnæ less deeply lobed; lobes obtuse; lower veinlets (1 or 2 pairs) uniting with the corresponding ones of contiguous lobes and sending out a ray-like veinlet to the sinus; indusium very hairy.

* * * *Fronds smooth, from once to thrice pinnate, growing in a crown from a stout and chaffy rootstock, and often remaining green through the winter: veins 2–4-forked or branching. Wild species of the country.*

+ *Fronds imperfectly evergreen, once pinnate with deeply pinnatifid pinnæ, or nearly twice pinnate: fruit-dots not close to the margin: indusium rather large, flat, smooth, persistent.*

A. Goldiànum. Rich moist woods N.: fronds broadly ovate, 2°–4° high, 9′–12′ wide; pinnæ oblong-lanceolate, broadest about the middle, parted to the

midrib; divisions very numerous, nearly 1′ long, somewhat scythe-shaped, rather acute, serrate with incurved teeth; fruit-dots very near the midvein.

A. cristàtum. Wet places in woods, common: fronds narrowly oblong, 1° – 2° high, 3′ – 5′ wide, rather rigid, erect; pinnæ triangular-ovate, broadest at base, pinnatifid almost to the midrib, divisions not many, oblong, obtuse, finely serrate, the largest ones sometimes toothed or pinnatifid-lobed; fruit-dots half-way between midvein and margin. — Var. CLINTONIÀNUM, in swampy woods, N., is very much larger every way, with fruit-dots nearer the midvein, and is often mistaken for A. Goldianum. — Var. FLORIDÀNUM, in wet woods S., has the lower pinnæ triangular-lanceolate and sterile, but the upper ones fertile, narrower and longer, with very short obtuse rather distant divisions, which are decurrent on the winged secondary rhachis.

++ *Fronds imperfectly evergreen, twice or thrice pinnate: the divisions cut-toothed or incised: fruit-dots not near the margin: indusium rather small, withering away.*

A. spinulòsum. Shady woods, very common N.: fronds thin, oblong-ovate; pinnæ oblong-lanceolate, the lower ones broader and somewhat triangular; pinnules very numerous, oblong-ovate, pinnately incised, the oblong lobes with *spinulose teeth toward the ends; indusium smooth or minutely glandular* at the margin. — Has several forms. — Var. DILATÀTUM, in mountainous places, N., is larger, broader in outline and commonly but twice pinnate; pinnules of the lowest pinnæ greatly elongated. — Var. BOÓTTII, in swampy woods N., is 2° – 3° high, of narrow outline, barely twice pinnate, with oblong-ovate toothed pinnules, or the lower ones pinnatifid: — it runs apparently into A. cristatum.

+++ *Fronds fully evergreen, thickish, about twice-pinnate: fruit-dots near the margin: indusium thickish, convex, persistent.*

A. marginàle. Rocky woods, common N.: *fronds* 1° – 2° *long, ovate-oblong,* bluish-green, the stalk very chaffy; pinnæ lanceolate, 3′ – 5′ long; pinnules oblong often curved, entire or *obtusely toothed, attached by a broad* base to the narrowly winged secondary rhachis; fruit-dots close to the margin, rather large.

§ 2. POLÝSTICHUM. *Indusium orbicular, peltate, attached by the centre to a short stalk: veins forking, free: wild species of the country.*

A. acrostichoides. Rocky woods, common; fronds 1° – 2° high, growing in crowns, with chaffy rootstocks and stalks, evergreen, shining, lanceolate, simply pinnate; pinnæ numerous, oblong-lanceolate from an unequal half-halberd-shaped base, serrulate with bristle-pointed teeth, rarely incised, upper ones of the fertile frond smaller and bearing copious soon confluent fruit-dots.

§ 3. CYRTÒMIUM. *Indusium as in* § POLYSTICHUM. *Fronds once pinnate: veins pinnate from the midrib, pinnately branching, the veinlets reticulated and forming arched meshes with* 1 – 3 *free included veinlets rising from the base of the arch: exotic.*

A. falcàtum. Cult. from Japan: fronds 1° – 2° high, 5′ – 9′ broad; base of stalk chaffy with large scales; pinnæ thick and shining, end one large and rhomboid or halberd-shaped; side ones few or many, oblong-ovate, long-pointed, nearly entire, lower side of base rounded, upper side angled or slightly auricled; fruit-dots in many rows on all or nearly all the pinnæ.

16. CYSTÓPTERIS. (Greek for *Bladder Fern*, alluding to the thin, sometimes inflated indusium.) Species few, mostly Northern.

C. frágilis. Shaded or moist rocky places, common N.: fronds very delicate, 4′ – 8′ long, with slender stalks, oblong-ovate, twice-pinnate; pinnæ with a narrowly margined rhachis; pinnules oblong or ovate, toothed or incised, very variable; indusium pointed at the upper end.

C. bulbífera. Wet places, oftenest in ravines, from N Carolina N.: fronds 1° – 2° high, 3′ – 5′ wide at the base, narrowed above and much elongated, twice pinnate, bearing scattered bulblets beneath; pinnules oblong, obtuse, toothed or pinnatifid; indusium roundish, truncate on the upper side.

17. STRUTHIÓPTERIS, OSTRICH-FERN (which the name means in Greek, from the large plume-like sterile fronds).

S. Germànica. Alluvial grounds, N.: sterile fronds tall, 2° – 5° high, lanceolate, narrowed at the base into a short angular stalk, pinnate; pinnæ very many, narrowly lanceolate, pinnatifid more than half-way to the midrib; lobes numerous, oblong; fertile fronds very much shorter, blackish, standing erect after the others have withered.

18. ONOCLÈA. SENSITIVE-FERN. (Name, from the Greek, meaning a *closed vessel*, referring to the berry-like fructification.) The only species is

O. sensíbilis. Common in wet places: sterile fronds of all sizes up to 2° high, broadly triangular-ovate, the rhachis winged; pinnæ not many, lanceolate, entire or obtusely lobed less than half-way to the midrib, veins everywhere reticulated; fertile fronds with few closely appressed pinnæ.

19. WOÓDSIA. (For *Joseph Woods*, an English botanist.)

W. obtùsa. Rocky places, from Carolina N.: fronds 6′ – 18′ high, slightly glandular, broadly lanceolate, pinnate with ovate or oblong deeply pinnatifid or again pinnate divisions; lobes oblong, obtuse; indusium at first closed, opening into a few ragged lobes.

W. Ilvénsis. Exposed rocks, common N., and along the Alleghanies: forms large tufts; fronds 4′ – 8′ high, rusty chaffy beneath, oblong-lanceolate, pinnate; divisions ovate, obtusely lobed; indusium obscure, consisting of a few jointed hairs.

20. DAVÁLLIA. (Named for *M. Davall*, a Swiss botanist.) Many tropical or sub-tropical species, the following cult. in conservatories.

D. Canariénsis, HARE'S-FOOT-FERN, from the Canary Islands, etc.: rootstock creeping above ground, covered with brownish scales, and looking not unlike an animal's paw; fronds few, smooth, broadly triangular, 8′ – 15′ long and about as wide, 3 – 4-pinnate; pinnules cut into a few narrow lobes; these are directed upwards, bearing at or just below the end a single fruit-dot; indusium whitish, deeply half-cup-shaped.

D. tenuifòlia, from India and China: rootstock creeping, crisp with short chaffy hairs; fronds smooth, 1° – 2° high, broadly lanceolate, 3 – 4-pinnate; smallest divisions narrowly wedge-shaped, bearing at the truncated ends one or two fruit-dots; indusium brownish, mostly broader than deep.

21. DICKSÒNIA. (For *James Dickson*, an English botanist.) The species all but one tropical or in the southern hemisphere.

D. punctilóbula. Moist shady places, from N. Carolina N.: rootstock creeping, slender; fronds scattered, thin, minutely glandular, pleasantly odorous, lancelote, long-pointed, 2° – 3° high, mostly bipinnate; pinnules pinnatifid; the divisions toothed, each bearing a minute fruit-dot at the upper margin; indusium globular.

D. antárctica. Tree-fern from New Zealand, a great ornament in large conservatories: trunk 3′ – 5′ thick, sometimes many feet high, bearing in a crown at the top many fronds, 6° – 9° long, 2° – 4° broad, coriaceous, twice pinnate; pinnules oblong, acute, pinnatifid; the oblong-ovate divisions bearing 1 – 4 rather large fruit-dots; indusium prominent, plainly two-valved.

22. CYÁTHEA. (Name from the Greek word for a *small cup*, referring to the involucre.) Tree-ferns from tropical countries.

C. arborea. Rarely cult. from W. Indies: trunk sometimes 20° high, stalk mostly light-brown, and without prickles or chaff; fronds 4° – 10° long, bipinnate; pinnæ 1° – 2° long, 6′ – 8′ wide, lanceolate; pinnules narrowly lanceolate, spreading, pinnatifid to the midrib; lobes oblong, slightly serrate, with 4 – 9 fruit-dots near the midvein; involucre beautifully cup-shaped, the margin entire. — Several other species, as well as one or two of the allied genus HEMITELIA (with an imperfect involucre, veins often partly reticulated), are rarely seen in conservatories.

23. ALSÓPHILA. (From Greek words meaning *grove-loving*, the species growing in tropical forests.

A. áspera. Rarely cult. from W. Indies: trunk 6° – 8° high; stalks prickly, clothed at the base with pale, narrow scales; fronds 6° – 8° long, 2° – 3° wide, bipinnate; rhachis hairy above; pinnæ oblong-lanceolate; pinnules very many, lanceolate, pinnatifid *almost to the midrib*; lobes oblong, curved, serrate, obtuse; fruit-dots 8 – 10 *to a lobe*; *indusium a thin scale on one side of* the fruit-dot, often disappearing with age.

A. pruinàta, from S. America, is sometimes seen; a much smaller plant; rootstock short, clothed *with bright-brown wool*; *fronds smooth, green above,* pale and glaucous often almost white beneath, bipinnate; pinnules deeply toothed; fruit-dots solitary at the base of each tooth; spore-cases mixed with woolly hairs.

24. TRICHÓMANES. (An ancient Greek name of some Fern, referring to the hair-like stalks.) A large genus; most of the species tropical.

T. radicans. On dripping rocks, Alabama and Tennessee, very rare: fronds pellucid, 4′ – 8′ high, *the* stalk and rhachis narrowly winged, lanceolate, pinnate with 1 – 2-pinnatifid ovate pinnæ; involucres on short lobes, funnel-shaped, with long exserted receptacles. — A broader and more compound form from Killarney, Ireland, is grown in Wardian cases.

25. LYGÒDIUM, CLIMBING-FERN. (Name from a Greek word meaning *flexible*, alluding to the twining and climbing fronds.) Not many species; all but ours tropical.

L. palmàtum. Low shady woods, rather rare: smooth, slender, and delicate, 2° – 4° high, *entangled among herbs*; *pinnæ roundish*, 12″ – 18″ wide, deeply heart-shaped at the base, palmately 5 – 7-lobed, upper ones decompound and fertile.

L. Japónicum. Conservatory plant from Japan: climbing 10° – 12° high, smooth; pinnæ ovate, 5′ – 9′ long, bipinnate, divisions ovate-lanceolate, often halberd-shaped; divisions of the upper pinnæ bordered with narrow fertile lobes.

26. ANEÌMIA. (Name from the Greek, meaning *without covering*, alluding to the naked spore-cases.) Mainly tropical.

A. Phyllítidis. Cult. from S. America: 12′ – 18′ high, has the two lower pinnæ long-stalked, narrowly-elongated, 3 – 4-pinnate, fertile; middle portion of the frond sterile, simply pinnate; pinnæ lanceolate, finely serrate; veins reticulated.

A. adiantoides. Native in Key West, Florida; with lower pinnæ as in the last; middle portion sterile, 2 – 3-pinnate; pinnæ long-pointed; divisions obovate-wedge-shaped, entire or toothed at the end, with free veins forking from the base.

27. SCHIZÆA. (Name from the Greek verb which means *to split*, referring to the many-forked fronds of certain tropical species.)

S. pusilla. Wet sand, in pine woods of New Jersey: *sterile fronds very* slender, flattened, simple and linear, curled up; fertile ones similar, but straight, 2′ – 3′ high, bearing at the top the fertile portion, 2″ – 3″ long, composed of about 5 pairs of minute pinnæ.

28. OSMÚNDA, FLOWERING FERN. (Name of doubtful origin, anciently "*Osmund the Waterman*," who was perhaps St. Osmund, Bishop of Salisbury, or possibly St. Christopher, patron of watermen. *Vide Hooker's British Ferns.*) Species very few, fruiting in spring or early summer.

* *Fruiting fronds distinct from the leafy ones.*

O. cinnamomea, CINNAMON-FERN. Swamps, abundant everywhere: sterile fronds 2° – 5° high, broadly lanceolate, pinnate with many lanceolate, deeply pinnatifid pinnæ; fertile ones much shorter, at first woolly, soon withering; fructification bright cinnamon color.

* * *Fructification borne at the top or middle of an otherwise leafy frond.*

O. Claytoniàna. Wet places, common: sterile fronds much like those of the last, but more obtuse at the top; fertile ones with 2-4 pairs of contracted and fertile blackish pinnæ just below the middle, — otherwise like the sterile.

O. regàlis, ROYAL FERN. Also common in swamps and wet woods, fruiting later than the others: fronds truly bipinnate; pinnules oval or oblong, serrulate, obtuse, sometimes a little heart-shaped at base, or slightly auricled on one side; fertile portion at the top of the frond, panicled; spore-cases light-brown.

29. BOTRYCHIUM, MOONWORT. (Name from the Greek word for a *bunch of grapes*, from the appearance of the fructification.) Species very few, none cultivated.

B. ternàtum. Shaded grassy pastures and hillsides: plant fleshy, 3′-10′ high; common stalk with two branches, a long-stalked fertile one with twice or thrice pinnate fructification facing a triangular ternately compound sterile portion on a longer or shorter stalk. — Has several forms: var. LUNARIOÌDES has roundish kidney-shaped sterile divisions; in var. OBLÌQUUM they are lanceolate from an oblique base; and in var. DISSÉCTUM, pinnatifid into narrowly toothed and ragged lobes.

B. Virgínicum. In rich woods: plant herbaceous, not fleshy, 6′-18′ high; sterile portion sessile on the common stalk, thin, broadly triangular, ternate; the parts twice or thrice pinnate; divisions thin, oblong-lanceolate, incised or toothed; fertile portion long-stalked, twice or thrice pinnate. — Other smaller species occur rarely N.

30. OPHIOGLÓSSUM. (Greek equivalent of the common name.)

O. vulgàtum, ADDER'S-TONGUE. Wet meadows or hillside pastures, rare: 3′-10′ high; sterile portion somewhat fleshy, ovate or elliptical, entire, 1′-2′ long, sessile near the middle of the stalk which supports the short two-sided spike. — Some rare tropical species have large and palmate, or pendulous and ribbon-like fronds.

134. LYCOPODIACEÆ, CLUB-MOSS FAMILY.

Flowerless plants, often moss-like or fern-like, with leafy, often elongated and branching stems, the spores contained in rather large solitary spore-cases borne in the axils of the simple mostly awl-shaped leaves.

§ 1. *Growing on land: stems more or less elongated and branching: leaves mostly less than 1′ long, often minute: spore-cases in the axils of the upper (often transformed and imbricated) scale-like leaves.*

1. LYCOPODIUM. Mostly evergreen plants; the leaves awl-shaped, in 4 or more rows; the 2-valved kidney-shaped spore-cases all of one kind, containing only minute numberless spores.
2. SELAGINELLA. But one species evergreen N.: leaves mostly flattened, rarely awl-shaped, mostly in 4 rows, two rows being of smaller leaves; spore-cases of 2 kinds; one 2-valved and filled with minute spores, the other 3-4-valved and containing very few large spores.

§ 2. *Growing in water or mud: stems very short and corm-like: leaves rush-like, elongated, with large spore-cases adhering to the upper surface of their dilated bases, and as if imbedded in them.*

3. ISOETES. Outer spore-cases with large reticulated spores; inner ones with minute powdery spores.

1. LYCOPODIUM, CLUB-MOSS. (Name from the Greek, meaning *wolf's-foot*, probably from the short hairy branches of *L. clavatum*.) Species about 100, in all parts of the world: the following all wild species.

§ 1. *Fructification not in a distinct spike. Leaves all alike, dark-green, rigid, in about 8 rows.*

L. lucidulum. Damp woods N.: stems 4′–8′ long, tufted, ascending, forking; leaves spreading or reflexed, sharp-pointed, irregularly serrulate, dark green and shining.

§ 2. *Fructification spiked at the top of an erect branch: fertile leaves and those of the creeping stems nearly alike, soft, narrowly linear, many-rowed.*

L. alopecuroides. Pine-barren swamps, New Jersey & S.: scarcely evergreen: stem and sparingly forked sterile branches creeping, fertile ones 6′–18′ high, all rather stout and thickly clothed with spreading soft linear-awl-shaped bristly-ciliate leaves, those of the spike with long slender tips.

§ 3. *Fructification spiked: the fruiting leaves yellowish, scale-like, shorter and broader than those of the sterile branches.*

* *Spike sessile at the top of an ordinary branch.*

L. annótinum. Cold woods N.: stem creeping, 1°–4° long; branches 4′–9′ high, nearly erect, once or twice forked: leaves about 5-rowed, spreading or reflexed, rigid, lanceolate, acute, nearly entire; those of the solitary spikes ovate, with spreading points and ragged scarious margins.

L. dendroideum, Ground-Pine. Moist woods, common N.: rootstock creeping, under-ground, nearly leafless; stems looking much like a miniature hemlock, 9′–12′ high; the many spreading branches with shining lanceolate entire leaves in about six rows; leaves of the lower and often of the upper row smaller than the rest; spikes single, or 4–10 on a plant; scales ovate pointed, margin slightly scarious, nearly entire.

* * *Spikes raised above the ordinary branches on a slender stalk which has only a few inconspicuous leaves*

+ *Stems creeping, very short: spikes always single.*

L. Caroliniànum. Wet pine-barrens, New Jersey and S.: scarcely evergreen; stem and prostrate branches rooting underneath; leaves soft, lanceolate, entire, spreading horizontally, with an upper appressed row; spikes slender on stalks 4′–6′ high. — Allied in habit to L. alopecuroides.

+ + *Stems extensively creeping: spikes often in pairs or fours.*

L. clavàtum, Club-moss. Common N. in dry woods: running stem long and leafy; branches mostly erect, cordlike, irregularly pinnate; branchlets 4–10, thickly covered with linear-awl-shaped entire commonly bristle-tipped leaves; spikes mostly in pairs.

L. complanàtum. Dry woods, commonest among evergreens: running stems with scattered awl-shaped very small leaves; branches erect, several times branched; the parts repeatedly forked into many horizontally spreading flattened branchlets.

2. SELAGINÉLLA. (*Name a diminutive of Selago, a species of Lycopodium.*) Species over 200, the greater part tropical.

§ 1. *Native species.*

S. rupéstris. Exposed rocks: a common moss-like little evergreen; stems and densely tufted branches 1′–2′ high; leaves awl-shaped, marked with a narrow furrow on the back, and tipped with a minute bristly point; spikes four-cornered.

S. ápus. Damp places in meadows; common, especially S.: very delicate; stems 2′–4′ high, sparingly branched; leaves 4-rowed, those of the side rows spreading horizontally, scarcely 1″ long, ovate with the upper side larger, minutely serrulate; intermediate ones half as large, erect, very acute; spikes 2′–6″ long. — Often cult. as *S. densa.*

§ 2. *Cultivated mostly tropical species, seen in conservatories: much branched: leaves of the branches four-rowed, two side rows of spreading leaves set apparently edgewise, and two upper rows of smaller appressed leaves. Spike four-cornered, at the ends of the branchlets.*

* *Stems trailing, sending out rootlets nearly up to the end.*

+ *Branchlets only 1″ broad: leaves wide apart in each row.*

S. delicatíssima. Stems 4′ – 8′ long, irregularly forked and branched; branches rather distant; leaves oblong-roundish, obtuse, with a few slender cilia towards the base; intermediate ones ovate, pointed.

+ + *Branchlets 2″ – 3″ broad, their leaves closely placed in each row.*

S. Kraussiàna. (LYCOPODIUM DENTICULÀTUM of the florists.) Stems very long, articulated below each branch; branches distant, bearing a few short forked branchlets; leaves bright green, the larger ones oblong-ovate, acute, rounded on the upper side, nearly straight on the lower, minutely denticulate; smaller ones with longer often reflexed points.

S. uncinàta. (LYC. CÆSIUM of florists.) Stems very long, not articulated, freely branched; branches 2 – 3-pinnate with short crowded branchlets; leaves when living with a steel-blue iridescence, fading to green when dried, very closely placed, larger ones oblong, equal-sided, obtuse, entire; smaller ones ovate with slender incurved points.

* * *Stems ascending, only the lower part bearing long rootlets.*

S. Marténsii. (LYC. STOLONÍFERUM of florists.) Stems 6′ – 10′ long, much branched from the base; branches bipinnate, with copious branchlets 2′ – 3″ or even 4″ wide; larger leaves crowded, obliquely ovate, the upper side broadest, obtuse, entire; smaller ones ovate with a slender often recurved point.

* * * *Stems erect, or nearly so, rooting only at the very base.*

S. erýthropus. Stalk 2′ – 6′ high, bright red, having a few closely appressed red leaves, and bearing at the top a broad frond-like stem pinnately or pedately divided into a few 2 – 3 times pinnate branches, with very numerous extremely crowded branchlets 1″ – 1½″ wide; leaves closely imbricated, obliquely ovate-oblong, curved upward, rather obtuse, ciliate; smaller ones ovate, with long straight points.

S. Braúnii. (LYC. WILLDENÒVII of florists.) Stalk straw-color or pale red, shorter than in the last, finely pubescent, as are the branches; frond-like stems long-ovate, 4 times pinnate, resembling an elegant fern; branchlets not crowded, about 1″ wide; leaves scarcely imbricated, ovate, obtuse, entire; smaller ones with straight points.

* * * * *Stems in a dense nest-like tuft, not rooting: branches often curling up when dry.*

S. cuspidàta. (LYC. CIRCINÀLE of florists.) Frond-like stems 6′ – 8′ long, green above, paler beneath, oblong or lyre-shaped, loosely 3-pinnate; branchlets 1″ wide; leaves obliquely triangular-ovate, with long often incurved bristle-points, having a narrow whitish margin, sparingly ciliated and minutely denticulate; smaller ones obliquely ovate, with long slender points.

S. lepidophýlla, from Lower California, &c., is the "Bird's-Nest Moss," or "Resurrection-Plant." It is a nest-like ball when dry, but when moist it unfolds and displays the densely 2 – 3-pinnate elegant fern-like branches radiating from a coiled-up central stem; the leaves white-margined, closely imbricated, round-ovate, obtuse. — Nearly 30 species are cultivated in Great Britain, besides those here described.

3. ISÒETES, QUILLWORT. (Name from the Greek words for *equal* and *year*, meaning that the plant is the same at all seasons.) The species demand too nice discrimination for the beginner, and must be studied by aid of the Manual.

I. lacústris, rather rare only N., and the far commoner

I. echinóspora, are the principal northern species, living under water.

I. ripària and **I. Engelmánni,** with leaves 4′ – 20′ long, live partly out of water, at least for a part of the summer.

I. melanópoda, only W., lives in shallow ponds or pools which dry up in summer.

INDEX.

*** The names of the Classes, Subclasses, and Orders are in full capitals; those of the Genera, &c., as well as popular names, are in common type.

Abele-tree 308
Abies 310, 312
Abronia 283
Abutilon 70, 73
Acacia 99, 115
Acalypha 293, 295
ACANTHACEÆ 239
Acanthus 240
ACANTHUS FAMILY 239
Acer 89, 91
Acerates 276, 278
Achillea 183, 199
Achimenes 228
Achyranthes 286
Acnida 286
Aconitum (Aconite) 34, 41
Acorus 317, 318
ACROGENS 359
Acrostichum 360, 363
Actæa 34, 39
Actinomeris 184, 203
Adam-and-Eve 327
Adam's Needle 348
Adder's-tongue 346, 372
ADDER'S-TONGUE F. 363
Adiantum 361, 364
Adlumia 50
Adonis 34, 37
Æschynomene 95, 105
Æsculus 89, 90
African Marigold 206
Agapanthus 340, 348
Agati 106
Agave 330, 332
Ageratum 182, 193
Agrimonia (Agrimony) 125
Agrostis 353
Ailanthus 83
Albizzia 99, 114
Alchemilla 117, 125
Alder 307
Alder-Buckthorn 87
Alisma 320
ALISMACEÆ 319
Allamanda 274
Allium 340, 347
Almond 118
ALMOND FAM[illegible] 116
Alnus [illegible], 307
Aloe 341
Alonso[illegible] 283
Alopec[illegible]
Althæa 70, 71, 74
Alsophila 362, 371
Alstrœmeria 330, 332
Alum-Root 135
Alyssum 52, 56
AMARANTACEÆ 286
Amaranth 286
AMARANTH FAMILY 286
Amarantus 286
AMARYLLIDACEÆ 329
Amaryllis 330, 331
AMARYLLIS FAMILY 329
Amberboa (Amberboi) 188
Ambrosia 180, 188
Amelanchier 117, 129
American Laurel 216
American Aloe 332
American Columbo 272
American Ipecac 121
Amianthium 338, 342
Ammania 150
Ammobium 181, 190
Amorpha 95, 103
Ampelopsis 85, 86
Amphicarpæa 97, 109
Amsonia 274, 275
ANACARDIACEÆ 84
Anacharis 321, 322
Anagallis 223, 225
Ananassa 329
Andromeda 212, 215
Aneimia 362, 371
Anemone 34, 35
Angelica-tree 166
ANGIOSPERMOUS PLANTS 33
Anise-tree 43
Anoda 70, 72
ANONACEÆ 43
Antennaria 181, 190
Anthemis 183, 199
Anthoxanthum 355
Antirrhinum 230, 235
Anychia 64, 68
APETALOUS DIVISION 282
Aphyllon 228, 229
Apios 97, 108
Apium 163, 165
Aplectrum 324, 327
APOCYNACEÆ 274
Apocynum 274, 275
Apple 129
Apple-of-Peru 268
Apricot 118
AQUIFOLIACEÆ 218
Aquilegia 34, 40
Arabis 51, 54
ARACEÆ 317
Arachis 96, 106
Aralia 166
ARALIACEÆ 166
Arbor-Vitæ 315
Archangelica 163, 165
Arctostaphylos 211, 214
Arenaria 64, 67
Arethusa 323, 326
Argemone 48, 49
Arisæma 317
Aristolochia 282
ARISTOLOCHIACEÆ 282
Armeria 222
Arnica 182, 194
Aromatic Wintergreen 214
Arrenatherum 355
Arrow-Arum 318
Arrow Grass 320
ARROW-GRASS FAMILY 319
Arrow-Head 320
ARROWROOT FAMILY 328
Arrow-wood 172
Artemisia 180, 188
Artichoke 186
Arum Family 317
Arundinaria 354
Asarabacca 282
Asarum 282
ASCLEPIADACEÆ 276
Asclepias 276, 277
Ascyrum 61
Ash 281
Ash-leaved Maple 92
Asimina 44
Asparagus 339, 344
ASPARAGUS FAMILY 339
Aspen 308
Aspidium 361, 368
Asplenium 361, 366
Aster 183, 196
Astilbe 132, 137
Astragalus 96, 107
Atamasco Lily 331
Atragene 35
Atriplex 284
Atropa 266, 269

Aubergine 267
Aucuba 167, 168
Auricula 223
Avena 355
Avens 122
Azalea 212, 217

Bald-Cypress 314
Balloon-Vine 90
Ballota 252
Balm 249, 250
Balm-of-Gilead 251
Balm-of-Gilead Poplar 309
Balmony 238
Balsam 81
Banana 329
BANANA FAMILY 328
Baneberry 39
Baptisia 98, 111
Barbadoes Flower-fence 113
Barbarea 51, 54
Barberry 45
BARBERRY FAMILY 44
Barley 357
Barnyard Grass 357
Barren Strawberry 121
Barren-wort 45
Bartonia 151, 271, 273
Basil 248, 249
Basil Thyme 249
Basswood 75
Bastard *Pennyroyal* 246
Bauera rubioides 131
Bayberry 303
Bean 108
Bean-trefoil-tree 101
Bearberry 214
Bear-Grass 348
Beaver-Poison 165
Bedstraw 174
Bee-Balm 249
Beech 305
Beech-Drops 229
Beech-Fern 367
Beehive 101
Beet 285
Beggar's Lice 257
Beggar-Ticks 202
Begonia 161
BEGONIACEÆ 161
BEGONIA FAMILY 161
Belladona 269
Bellflower 210
Bellis 182, 183, 199
Bellwort 343
BELLWORT FAMILY 338
Bengal Grass 357
Benjamin-Bush 291
Benzoin 291
BERBERIDACEÆ 44
Berberis 44, 45
Berchemia 86, 87
Bergamot 250
Bermuda Grass 356
Beta 284, 285
Betonica (Betony) 246, 253
Betula 306
BETULACEÆ 306
Bidens 184, 202
Bignonia 226, 227
BIGNONIACEÆ 226
BIGNONIA FAMILY 226
Bilsted 140
Bindweed 264, 289
Biota 315
Birch 306
BIRCH FAMILY 306
Bird's-nest Fern 366
Birthroot 341

Birthwort 282
BIRTHWORT FAMILY 282
Bishop's-Cap 137
Bitter-Cress 54
Bitter Sweet 88
Bittersweet 268
Bitterweed 188
Black alder 219
Black bean 109
Blackberry 124
Blackberry Lily 334
Black Grass 349
Black Moss 329
Black Sampson 205
Black Snakeroot 39
Black-Thorn 118
Bladder Campion 66
Bladder Ketmia 74
Bladder-nut 90
BLADDER-NUT FAMILY 89
Bladder-Senna 107
Bladderwort 225
BLADDERWORT FAMILY 225
Blazing-Star 191, 342
Bleeding Heart 50
Blephilia 245, 251
Blessed Thistle 187
Blite 285
Blitum 284, 285
Blood-root 49
Blue Beech 305
Blueberry 213
Bluebottle 187
Blue Curls 246
Bluets 176
Blue-Eyed-Grass 335
Blue Flag 333
Blue Hearts 234
Blue-Joint Grass 353
Blue Lettuce 208
Blue-Tangle 213
Blueweed 255
Blumenbachia 152
Bocconia 48, 49
Bœhmeria 297, 299
Bois d'Arc 299
Bokhara 101
Boltonia 183, 198
Bonamia 263, 264
Boneset 192
Borage 255
BORAGE FAMILY 254
BORRAGINACEÆ 254
Borrago 254, 255
Botrychium 368, 372
Bottle-brush 149
Bottle Gourd 159
Bottle Grass 357
Bouncing Bet 66
Boussingaultia 284, 285
Bouvardia 174, 176
Bowman's Root 121
Bow-Wood 299
Box 296
Boxberry 214
Box-Elder 92
Boykinia 132, 136
Brachycome 183, 198
Bracted Bindweed 264
Brake 365
Bramble 124
Brassica 51, 52
Brasenia 46
BRASILETTO FAMILY 98
Brier Rose 125
Briza 355
Broccoli 52
Brodiæa 341

Brome Grass 355
BROMELIACEÆ 329
Bromus 355
Brooklime 234
Brookweed 225
Broom-corn 357
BROOM-RAPE FAMILY 228
Broussonetia 297, 299
Browallia 229, 232
Brunella 245, 252
Brunfelsia 229, 232
Bryophyllum 138, 139
Buchnera 230 234
Buckeye 90
Buckthorn 87
BUCKTHORN FAMILY 86
Buckwheat 289
BUCKWHEAT FAMILY 287
Buffalo-Berry 292
Buffalo-nut 292
Bugbane 39
Bugleweed 247
Bugloss 257
Bulrush 352
Bumelia 220
Bunch-berry 167
Bunch-Flower 343
Burchellia Capensis 173
Burdock 187
Bur-Marigold 202
Burnet 125
Burning-bush 88
Bur-Reed 319
Bush-Clover 104
Bush-Honeysuckle 171
Butcher's Broom 344
Butomeæ 320
Butter-and-Eggs 235
Buttercup 374
Butterfly-Pea 109
Butterfly-Weed 277
Butternut 300
Butterweed 193, 198
Butterwort 226
Button-bush 175
Button-Snakeroot 164, 191
Button-weed 175
Buttonwood 300
Buxus 293, 296

Cabbage 52
Cacalia 182, 193, 194
CACTACEÆ 152
CACTUS FAMILY 152
Cæsalpinia 99 113
Calophora 152
Cakile 52, 56
Calabash 159
Caladium 317
Calamagrostis 353
Calaminth 249
Calamintha 249
Calampelis 227
Calamus 318
Calandrinia 69
Calceolaria 230, 234
Calendula 184, 200
Calico-bush 216
California Nutmeg-tree 315
Calla 317, 318
Callicarpa 241, 243
Calliopsis 201
Callirrhoë 70, 72
Callistemon 149
Callistephus 182, 196
Calluna 211, 214
Calochortus 341
Calonyction 263
Calopogon 324, 326

False Solomon's Seal 344
Farfugium 194
Farkleberry 213
Featherfoil 225
Feather Geranium 285
Fedia 177, 178
Fennel 165
Fennel-flower 40
Fenugreek 101
FERN FAMILY 360
Fescue Grass 354
Festuca 354
Fetid Marigold 206
Feverbush 291
Feverfew 199
Fever-tree 176
Feverwort 170
Ficus 296, 298
Fig 298
FIG FAMILY 296
Fig-Marigold 157
FIG-MARIGOLD FAMILY 156
Figwort 238
FIGWORT FAMILY 229
Filago 181, 189
Filbert 305
FILICES 360
Filmy Ferns 362
Finger-Grass 357
Fiorin 353
Fir 312
Fire-Pink 66
Fireweed 143, 189
Five-finger 122
Flax 77
FLAX FAMILY 77
Fleabane 198
Flœrkea 78, 79
Flower-de-luce 333
Flowering-Fern 371
FLOWERING FERNS 362
FLOWERING-RUSH FAMILY 320
FLOWERING PLANTS 12, 33
Flowering Wintergreen 93
FLOWERLESS PLANTS 359
Flower-of-an-hour 74
Fly-Poison 342
Fœniculum 163, 165
Fog-fruit 242
Forget-me-not 256
Forked chickweed 68
Forsteronia 274, 275
Forsythia 279, 280
Fothergilla 140
Four-o'clock 283
FOUR-O'CLOCK FAMILY 283
Foul-Meadow-Grass 354
Foxglove 237
Foxtail-Grass 357
Fragaria 116, 123
Franciscea 232
Frangula 87
Franklinia 76
Frasera 271, 272
Fraxinella 82
Fraxinus 279, 281
French Marigold 206
French Mulberry 243
Fringe-Tree 281
Fritillaria 340, 346
Frogs-Bit 322
FROG'S-BIT FAMILY 321
Frostweed 60
Fuchsia 142, 147
Fumaria 50
FUMARIACEÆ 49
Fumitory 50
FUMITORY-FAMILY 49
Funkia 340, 348
Gaillardia 183, 200
Galactia 97, 109
Galanthus 330, 331
Galeopsis 246, 252
Galium 173, 174
Gall-of-the-Earth 207
Gama Grass 358
Gardenia 174, 176
Garget 284
Garland Flower 328
Garlic 347
Garrya 167
Gaultheria 211, 214
Gaura 142, 143
Gaylussacia 211, 213
Gazania 183, 200
Gelsemium 273
Genista 94, 100
Gentiana (Gentian) 271, 272
GENTIANACEÆ 270
GENTIAN FAMILY 270
Georgia Bark 176
GERANIACEÆ 77
Geranium 78, 79
GERANIUM FAMILY 77
Gerardia 231, 236
Germander 246
German Ivy 194
GESNERIACEÆ 228
Gesneria 228
GESNERIA FAMILY 228
Geum 116, 122
Giant Hyssop 251
Gilia 260, 261
Gill 251
Gillenia 116, 121
Gilliflower 53
GINGER FAMILY 328
Ginkgo-Tree 315
Ginseng 167
GINSENG FAMILY 166
Girasole 204
Glade-Mallow 72
Gladiolus 333, 335
Glasswort 284
Gleditschia 99, 114
Globe-flower 39
Globe Hyacinth 347
Glottidium 106
Gloxinia 228
GLUMACEOUS DIVISION 30, 352
Gnaphalium 181, 189
Goatsbeard 121
Godetia 145
Golden Aster 195
Golden Chain 101
Golden-Rod 195
Golden Saxifrage 137
Gold-Fern 364
Goldthread 39
Gomphrena 286, 287
Gonolobus 276, 278
Good-King-Henry 285
Goodyera 323, 326
Gooseberry 133
Goosefoot 285
GOOSEFOOT FAMILY 284
Goose-grass 175, 287
Gordonia 76
Gossypium 70, 74
Gourd 159
GOURD FAMILY 158
GRAMINEÆ 353
Granadilla 158
Grape 85
Grape Hyacinth 347
Grass-Cloth Plant 299
GRASS FAMILY 353
Grass-of-Parnassus 135
Grass-of-the-Andes 355
Grass-Wrack 316
Gratiola 231, 237
Greek Valerian 262
Greenbrier 336
Green-Dragon 318
Green Milkweed 278
Green-weed 100
Gromwell 256
Ground Cherry 268
Ground Ivy 251
Ground Laurel 214
Ground-nut 106, 108, 167
Ground-Pine 373
Ground Pink 261
Ground Plum 107
Groundsel 193
Guava 149
Gueider Rose 172
Guinea Corn 357
Guinea-Hen Flower 346
Gumbo 74
Gymnocladus 99, 113
Gymnogramme 360, 364
GYMNOSPERMOUS PLANTS 27, 309
Gynandropsis 57
Gynerium 358
Gypsophila 64, 66
Habenaria 323, 324
Habrothamnus 270
Hackberry 298
Hackmatack 314
Halesia 220, 221
HALORAGEÆ 140
HAMAMELACEÆ 140
Hamamelis 140
Hardenbergia 97, 109
Hardhack 120
Harebell 210
Hare's-Foot-Fern 370
Hart's-tongue 363, 367
Haw 128, 172
Hawkbit 206
Hawkweed 207
Hawthorn 128
Hazel-nut 305
Heal-all 252
Heart's-ease 59
Heart-Seed 90
Heath 214
Heather 214
HEATH FAMILY 210
Hedeoma 244, 248
Hedera 166, 167
Hedgehog Cone-Flower 205
Hedge-hyssop 237
Hedge-Mustard 53
Hedge-Nettle 253
Hedychium 328
Helenium 183, 200
Helianthemum 60
Helianthus 184, 203
Helichrysum 190
Heliophytum 255, 258
Heliopsis 184, 204
HELIOTROPE FAMILY 255
Heliotropium (Heliotrope) 255, 257
Hellebore 343
Helleborus (Hellebore) 34, 39

Helonias 338, 342
Hemerocallis 340, 348
Hemitelia 370
Hemlock Spruce 313
Hemp 299
HEMP FAMILY 297
Hemp-Nettle 252
Henbane 269
Hepatica 34, 35
Heracleum 163, 166
Herba Impia 189
Herb Robert 79
Hercules' Club 166
Herd's Grass 356
Hesperis 51, 53
Heteranthera 322
Heterocentron 148
Heuchera 132, 135
Hibiscus 70, 74
Hickory 301
Hieracium 185, 207
Hierochloa 356
Hippuris 141
Hoary-pea 106
Hobble-bush 172
Hog-Pea-nut 109
Hogweed 188
Holcus 355
Holly 219
HOLLY FAMILY 218
Hollyhock 71
Holly-Grass 356
Honesty 55
Honey-Locust 114
Honeysuckle 170
HONEYSUCKLE FAMILY 169
Hop 299
Hop-Hornbeam 305
Hop-tree 83
Hordeum 357
Horehound 252
Hornbeam 305
Horse-Balm 248
Horse Bean 111
Horse-Chestnut 90
Horse-Gentian 170
Horse-mint 250, 251
Horse-Nettle 267
Horseradish 53
Horse-Sugar 221
Horse-tail 359
HORSE-TAIL FAMILY 359
Horseweed 198
Hoteia 137
Hottonia 223, 225
Houndstongue 191, 257
Houseleek 138
Houstonia 174, 176
Hoya 276, 278
Huckleberry 213
Hudsonia 60
Humea 181, 190
Humulus 297, 299
Hyacinthus 340
Hyacinth 348
Hydrangea 132, 135
Hydrastis 34, 38
HYDROCHARIDACEÆ 321
Hydrocotyle 163, 164
Hydrolea 258, 260
Hydrophyllum 258, 259
HYDROPHYLLACEÆ 258
HYMENOPHYLLACEÆ 362
Hyoscyamus 266, 269
HYPERICACEÆ 61
Hypericum 61
Hypoxys 329, 330
Hyptis 244, 247
Hyssopus (Hyssop) 244, 248

Iberis 52, 55
Ice-Plant 157
Ilex 219
Illicium 42, 43
Ilysanthes 231, 237
Immortelle 189, 190
Impatiens 78, 81
Imphee 357
Ipomœa 262, 263
Ipomopsis 261
Indian Bean 227
Indian Corn 358
Indian Cress 81
Indian Cucumber-Root 342
Indian Currant 170
Indian Fig 153
Indian Hemp 275
Indian Mallow 73
Indian Millet 357
Indian Physic 121
Indian Pipe 218
INDIAN PIPE FAMILY 212
Indian Plantain 193
Indian Poke 343
Indian Rice 353
Indian Shot 328
INDIAN-SHOT FAMILY 328
Indian Turnip 317
Indian Wheat 289
India-Rubber-Tree 298
Indigofera 96, 106
Indigo-plant 106
Inkberry 219
Inula 182, 195
Iresine 286
IRIDACEÆ 332
Iris 332, 333
IRIS FAMILY 332
Irish Broom 100
Iron-weed 190
Iron-wood 305
Isanthus 243, 246
Isatis 52, 56
Isoëtes 372, 374
Italian May 120
Italian Millet 357
Itea 132, 134
Ivy 167
Ixia 333

Jacobæan Lily 331
Jacob's Ladder 262
Jamestown-Weed 269
Japan Alspice 131
Jasminum 279, 280
Jatropha 293, 296
Jeffersonia 45, 46
Jerusalem Artichoke 204
Jerusalem Cherry 268
Jerusalem Oak 285
Jerusalem Sage 253
Jessamine 280
Jewel-Weed 81
Joe-Pye Weed 192
Jointed Charlock 56
Jointweed 287
Jonquil 331
Judas-tree 113
JUGLANDACEÆ 300
Juglans 300
JUNCACEÆ 349
Juncus 349
June-Berry 129
Juniperus (Juniper) 310, 315
Jupiter's-Beard 177
Jussiæa 142, 145
Kale 52
Kalmia 212, 216
Kennedya 97, 110
Kentucky Blue Grass 354
Kentucky Coffee-tree 113
Kerria 116, 121
Kidney Bean 108
Kinnikinnik 168
Kitaibelia 70, 71
Knapweed 187
Knawel 68
Knot-grass 287
Knotweed 287
Kœlreuteria 89, 90
Kohlrabi 52
Kosteletzskya 70, 73
Kuhnia 182, 191

LABIATÆ 243
Labrador Tea 217
Laburnum 94, 101
Lactuca 186, 208
Ladies' Eardrops 147
Ladies' Smock 55
Ladies'-Tresses 326
Lady-Fern 367
Lady's Mantle 125
Lady's Slipper 327
Lady's Thumb 288
Lagenaria 158, 159
Lagerstrœmia 149, 150
Lambkill 216
Lamb-Lettuce 178
Lamb's-Quarters 285
Lamium 246, 252
Lantana 241, 242
Laportea 297, 299
Lappa 180, 187
Larch 313
Large Cane 354
Larix 310, 313
Larkspur 40
Lathyrus 98, 110
LAURACEÆ 290
LAUREL FAMILY 290
Laurestinus 172
Lavandula 244, 247
Lavatera 70, 71
Lavender 247
Lead-Plant 103
Leadwort 222
LEADWORT FAMILY 222
Leaf-cup 201
Leather-leaf 215
Leatherwood 292
Lechea 60, 61
Ledum 212, 217
Leek 347
LEGUMINOSÆ 94
Leiophyllum 212, 217
Lemna 316
LEMNACEÆ 316
Lemon 83
Lemon-scented Verbena 242
Lens 98, 111
LENTIBULACEÆ 225
Lentil 111
Leontodon 185, 206
Leonurus 246, 253
Lepachys 185, 205
Lepidium 52, 56
Leptosiphon 261
Lespedeza 95, 104
Lettuce 208
Leucanthemum 183, 199
Leucoium 330, 332
Leucothoë 211, 215
Lever-wood 305

Levisticum 163, 165
Liatris 182, 191
Ligustrum 279, 280
Lilac 280
LILIACEÆ 337
Lilium 340, 345
Lily 345
LILY FAMILY 337, 339
Lily-of-the-Valley 344
Lime 83
Lime-tree 75
Limnanthemum 271, 273
Limnanthes 77, 79
Limnobium 321, 322
Limnocharis 320, 321
LINACEÆ 77
Linaria 230, 235
Linden 75
LINDEN FAMILY 75
Lindera 291
Ling 214
Linnæa 169, 170
Linum 77
Lion's-Foot 207
Lippia 241, 242
Liquidambar 140
Liriodendron 42
Lithospermum 254, 256
Live-for-ever 138
Liver-leaf 35
Lizard's Tail 293
LIZARD'S-TAIL FAMILY 293
Loasa 152
LOASACEÆ 151
LOASA FAMILY 151
Lobelia 208
LOBELIACEÆ 208
LOBELIA FAMILY 208
Loblolly Bay 76
Locust-tree 107
LOGANIACEÆ 273
LOGANIA FAMILY 273
Lolium 356
Long Moss 329
Lonicera 169, 170
Loosestrife 150, 224
LOOSESTRIFE FAMILY 149
Lopezia 142, 147
Lophanthus 245, 251
Lophospermum 231, 236
Lopseed 241
Loquat-Tree 129
LORANTHACEÆ 292
Lotus 47
Lousewort 239
Lovage 165
Love-lies-Bleeding 286
Low Spear Grass 354
Lucerne 101
Ludwigia 142, 146
Lunaria 52, 55
Lungwort 255
Lupinus (Lupine) 94, 100
Luzula 349, 350
Lychnis 64, 65
Lycium 267, 270
Lycopersicum 266, 267
LYCOPODIACEÆ 372
Lycopodium 372
Lycopsis 255, 257
Lycopus 244, 247
Lygodium 362, 371
Lysimachia 223, 224
LYTHRACEÆ 149
Lythrum 150
297, 299
174

MADDER FAMILY 173
Madwort 56
Magnolia 42
MAGNOLIACEÆ 42
MAGNOLIA FAMILY 42
Mahernia 75
Mahogany-tree 84
Mahonia 45
Mahon stock 53
Maiden-hair 364
Maize 358
Malcolmia 51, 53
MALLOW FAMILY 70
Mallow 71
Malope 70, 71
Malva 70, 71
MALVACEÆ 70
Malvaviscus 70, 73
Mamillaria 153, 156
Mandevillea 275
Mandrake 46
Manettia cordifolia 173
Man-of-the-Earth 263
Maple 91
MAPLE FAMILY 89
Maranta 328
Marestail 141
Marigold 200
Marjoram 249
Marrubium 246, 252
Marsh-Mallow 71
Marsh-Marigold 39
Marsh-Rosemary 222
Marsh St. John's-wort 63
Martynia 227, 228
Maruta 183, 199
Marvel-of-Peru 283
Masterwort 166
Matrimony-Vine 270
Matthiola 51, 53
Maurandia 231, 235
May-apple 46
Mayflower 214
Maypops 157
Mayweed 199
Meadow-Beauty 148
Meadow-Foxtail 356
Meadow Grass 354
Meadow-rue 36
Meadow-Soft-Grass 355
Meadow-Sweet 120
Medeola 337, 342
Medicago 94, 101
Medick 101
Melampyrum 232, 239
Melanthium 338, 343
MELANTHIUM FAMILY 337
MELASTOMACEÆ 148
MELASTOMA FAMILY 148
Melia 84
MELIACEÆ 84
MELIA FAMILY 84
Melilotus (Melilot) 94, 101
Melissa 245, 249
Melocactus 153, 156
Melon 160
Melon-Cactus 156
Melothria 159, 160
MENISPERMACEÆ 44
Menispermum 44
Mentha 244, 247
Mentzelia 151
Menyanthes 271, 273
Mermaid-weed 141
Mertensia 254, 255
MESEMBRYANTHEMEÆ 156
Mesembryanthemum 156, 157

Mexican Tea 285
Mezereum 291
MEZEREUM FAMILY 291
Mignonette 57
MIGNONETTE FAMILY 57
Mikania 182, 191
Milfoil 199
Milk-Pea 109
Milk Thistle 187
Milk-Vetch 107
Milkweed 277
MILKWEED FAMILY 276
Milkwort 92
Mimosa 99, 114
MIMOSA FAMILY 99
Mimulus 231, 237
Mint 247
MINT FAMILY 243
Mirabilis 283
Mist-Flower 193
Mistletoe 292
MISTLETOE FAMILY 292
Mitchella 174, 175
Mitella 133, 137
Mitreola 273
Mitrewort 137
Moccason-Flower 327
Mocker-nut 301
Mock-orange 119, 134
Modiola 70, 73
Mollugo 64, 68
Molucca Balm 253
Moluccella 246, 253
Momordica 158
Monarda 245, 250
Moneses 212, 218
Moneywort 224
Monkey-Flower 237
Monkshood 41
MONOCOTYLEDONOUS PLANTS 316
MONOPETALOUS DIVISION 169
Monotropa 212, 218
Montbretia 333
MOONSEED FAMILY 44
Moonwort 372
Moosewood 91, 292
Moræa 333
Morning Glory 263
Morus 297, 298
Moss Pink 261
Motherwort 253
Mountain Ash 130
Mountain Holly 218
Mountain Laurel 216
Mountain Mint 248
Mourning Bride 178
Mouse-ear Chickweed 67
Mouse-tail 37
Mud-Plantain 322
Mugwort 189
Mulberry 298
Mulgedium 186, 208
Mullein 233
Mullein-Foxglove 237
Musa 329
Muscadine 86
Muscari 340, 347
Muskmelon 160
Musk-plant 237
Musquash-Root 165
Mustard 52
MUSTARD FAMILY 51
Myosotis 254, 256
Myosurus 34, 37
Myrica 305, 306
MYRICACEÆ 305

Sassafras 290, 291
Satin-Flower 55
Satureia 244, 249
SAURURACEÆ 293
Saururus 293
Savin 315
Savory 249
Saw-Grass 352
Saxifraga (Saxifrage) 132, 136
SAXIFRAGACEÆ 131
SAXIFRAGE FAMILY 131
Scabiosa (Scabious) 178
Schallott 347
Scheuchzeria 319, 320
Schizandra 42, 43
Schizæa 362, 371
SCHIZÆACEÆ 362
Schizanthus 229, 232
Schizostylis 333
Schollera 322
Schrankia 99, 114
Scilla 340, 347
Scirpus 352
SCITAMINEÆ 328
Scleranthus 64, 68
Scolopendrium 361, 367
Scoke 284
Scorpion-grass 256
Scotch Broom 100
Scotch Thistle 187
Scouring-Rush 359
Scrophularia 231, 238
SCROPHULARIACEÆ 229
Scutch Grass 356
Scutellaria 245, 252
Scurvy-Grass 54
Sea Blite 284
Sea-Lavender 222
Sea-Rocket 56
Sea Sand-Reed 353
Secale 357
SEDGE FAMILY 352
Sedum 138
Selaginella 372, 373
Self-Heal 252
Sempervivum 137, 138
Seneca Grass 356
Seneca Snakeroot 93
Senecio 182, 193
Senna 113
Sensitive-brier 114
Sensitive-Fern 370
Sensitive Joint-Vetch 105
Sensitive-plant 114
Sequoia 310, 314
Service-Berry 129
Sesame Grass 358
Sesamum (Sesame) 227
SESAMUM FAMILY 227
Sesbania 96, 106
Setaria 357
Seymeria 231, 237
Shadbush 129
Sheep-berry 172
Shell-Flower 253
Shepherdia 292
Shepherd's-purse 55
Shield-Fern 368
Shin-leaf 218
Shooting-star 223
Shrub Yellow-root 38
Sicklepod 54
Sicyos 159, 160
Sida 70, 73
Sidesaddle-Flower 47
Silene 64, 65
Silk-Flower 114
Silk-tree 114
Silkweed 277
Silphium 184, 201
Silver-Bell-Tree 221
Silver-Berry 292
Silver-Fern 364
Silybum 180, 187
SIMARUBACEÆ 83
Siphocampylus 209
Sisymbrium 51, 53
Sisyrinchium 333, 335
Sium 163, 165
Skullcap 252
Skimmia 82, 83
Skunk Cabbage 318
Sloe 118
Smartweed 288
SMILACEÆ 336
Smilacina 339, 344
Smilax 334 - 336
SMILAX FAMILY 336
Smoke-tree 84
Snake-Cucumber 158
Snake-head 238
Snakeroot 192, 282
Snapdragon 235
Snowball-tree 172
Snowberry 170, 214
Snowdrop 331
Snowdrop-Tree 221
Snowflake 332
Sneezeweed 200
Sneezewort 199
Soapberry 90
SOAPBERRY FAMILY 88
Soapwort 66
SOLANACEÆ 265
Solanum 266, 267
Solidago 182, 195
Solomon's Seal 344
Sonchus 186, 208
Sophora 98, 112
Sorghum 357
Sorrel 289
Sorrel-tree 216
Sour Gum-tree 168
Sour-wood 216
Sowbread 224
Southernwood 189
Sow Thistle 208
Spadiceous Division 316
Spanish-Bayonet 348
Spanish Broom 100
Spanish Trefoil 101
Sparaxis 333
Sparganium 318, 319
Spartium Junceum 100
Spatter-Dock 47
Spearmint 247
Specularia 209
Speedwell 233
Spelt 357
Spergula 64, 68
Spergularia 64, 68
Spicebush 291
Spiderwort 351
SPIDERWORT FAMILY 350
Spigelia 273
Spikenard 166
Spinach 285
Spinacia 284, 285
Spindle-tree 88
Spiræa 116, 120
Spiranthes 323, 326
Spleenwort 366
Spoon-wood 216
Spotted Cowbane 165
Spring Beauty 69
Spruce 312
Spurge 294
SPURGE FAMILY 293
Spurge-Nettle 296
Spurred Butterfly-Pea 109
Spurred Valerian 177
Spurrey 68
Squash 159
Squaw-root 229
Squaw-weed 194
Squill 347
Squirrel-Corn 50
Squirting Cucumber 158
Stachys 246, 253
Staff-tree 88
STAFF-TREE FAMILY 87
Stagger-bush 215
Stag-horn Fern 363
Stapelia 276, 279
Staphylea 89, 90
Star-Anise 43
Star-Cucumber 160
Star-Flower 224
Star-Grass 322, 330
Star of Bethlehem 346
Star-Thistle 187
Starry Campion 66
Starwort 196
Starwort Chickweed 67
Statice 222
Steeplebush 120
Stellaria 64, 67
Stenanthium 338, 342
Stephanotis 276, 278
STERCULIACEÆ 75
STERCULIA FAMILY 75
Stickseed 257
Stillingia 293, 295
Stitchwort 67
Stock 53
Stone-Crop 138
Storax 221
STORAX FAMILY 220
Storksbill 79
Stramonium 269
Strawberry 123
Strawberry-bush 88
Strawberry Blite 285
Strawberry Geranium 136
Strawberry Tomato 268
Strelitzia 329
Streptopus 339, 343
Stuartia 76
Stylophorum 48, 49
Stylosanthes 95, 103
Styptic-Weed 113
STYRACACEÆ 220
Styrax 220, 221
Succory 206
Sugar Cane 358
Sumach 84
SUNDEW FAMILY 59
Sunflower 203
Suæda 284
Supple-Jack 87
Sutherlandia 96
Struthiopteris 361, 370
Swainsona 96
Sweet Basil 247
Sweet Bay 43
Sweet-Brier 126
Sweet Cicely 164
Sweet Clover 101
Sweet-Fern 306
Sweet Flag 318
Sweet Gale 306
SWEET GALE FAMILY 305
Sweet-gum Tree 140
Sweet-Leaf 221

Myriophyllum 141
Myrrhis odorata 164
Myrsiphyllum 339, 344
MYRTACEÆ 149
MYRTLE FAMILY 149
Myrtus 149

Nabalus 185, 207
NAIADACEÆ 316
Naked Broom-rape 229
Nandina 44, 45
Napæa 70, 72
Narcissus 330
Nasturtium 51, 53, 81
Navelwort 257
Neckweed 234
Nectarine 118
Negundo 89, 92
Nelumbium 46
Nelumbo 46
Nemastylis 333, 335
Nemopanthes 218
Nemophila 258, 259
Nepeta 245, 251
Nephrodium 368
Nerium 274, 275
Nesæa 150
Nettle 299
NETTLE FAMILY 296, 297
Nettle-Tree 298
New-Jersey Tea 87
New Zealand Flax 341
New Zealand Spinach 157
Nicandra 266, 268
Nicotiana 266, 269
Nierembergia 266, 269
Nigella 34, 40
Night-Blooming Cereus 154
Nightshade 267
NIGHTSHADE FAMILY 265
Nine-Bark 120
Niphobolus 363
Nolana 266, 267
NOLANA FAMILY 266
Nonesuch 101
Notholæna 361, 364
Nuphar 46, 47
Nut-Grass 352
Nutmeg-flower 40
NYCTAGINACEÆ 283
Nymphæa 46, 47
NYMPHÆACEÆ 46
Nyssa 167, 168

Oak 302
OAK FAMILY 301
Oat 355
Oat-Grass 355
Oca 79
Ocimum 243, 247
Œnothera 144, 148
Ogeechee Lime 169
Oil-nut 292
Okra 74
Olea 279, 280
OLEACEÆ 279
Oleander 274, 275
OLEASTER FAMILY 292
Olive 280
OLIVE FAMILY 279
Omphalodes 254, 257
ONAGRACEÆ 141
Onion 347
Onobrychis 95, 103
Onoclea 361, 370
Onopordon 180, 187
Onosmodium 254, 255
OPHIOGLOSSACEÆ 363
Ophioglossum 363, 372
Opuntia 152, 153
Orache 284
Orange 83
Orange-grass 62
Orange-root 38
Orchard-Grass 354
ORCHIDACEÆ 323
Orchis 323, 324
ORCHIS FAMILY 323
Origanum 244, 249
Ornithogalum 340, 346
OROBANCHACEÆ 228
Orpine 138
ORPINE FAMILY 137
Oryza 353
Osage-Orange 299
Osier 307
Osmanthus 281
Osmorrhiza 163, 164
Osmunda 362, 371
OSMUNDACEÆ 362
Ostrich-Fern 370
Ostrya 302, 305
Oswego Tea 250
Oxalis 77, 78
Oxeye 204
Ox-eye-Daisy 199
Oxybaphus 283
Oxydendrum 212, 216
Oyster-Plant 206

Pachysandra 293, 296
Pæonia 34, 41
Pæony 41
Painted-Cup 239
Palm 316
Palma-Christi 295
Palmetto 316
Pampas Grass 358
Pancratium 330, 331
Panicum 357
Pansy 59
Papaver 48
PAPAVERACEÆ 48
Papaw 44
Paper-Mulberry 299
Pardanthus 333, 334
Parnassia 132, 135
Parsley 165
PARSLEY FAMILY 162
Parsley Piert 125
Parsnip 166
Partridge-berry 175
Partridge Pea 113
Pasque-flower 36
Passiflora 157
PASSIFLORACEÆ 157
Passion Flower 157
PASSION-FLOWER FAMILY 157
Pastinaca 163, 166
Paulownia 230, 233
Pea 110
Peach 118
Peanut 106
Pear 129
PEAR FAMILY 117
Pearlwort 67
Pea-tree 106
Pecan-nut 301
Pedicularis 232, 239
Pelargonium 78, 79
Pellæa 361, 365
Peltandra 317, 318
Pencil-Flower 103
Pennyroyal 248
Pentas carnea 173
Penthorum 137, 138
Pentstemon 232, 238
Peppergrass 56
Peppermint 247
Pepperidge 168
Perilla 244, 247
Periploca 276, 279
Periwinkle 275
Persea 290, 291
Persimmon 219
Peruvian Bark 176
PETALOIDEOUS DIVISION 319
Petalostemon 95, 102
Petilium 346
Petroselinum 165
Petunia 266, 269
Phacelia 258, 259
PHÆNOGAMOUS PLANTS 33
Phalaris 354
Phaseolus 97, 108
Pheasant's-eye 65
Pheasant's-eye Adonis 37
Phegopteris 360, 367
Philadelphus 132, 134
Phlebodium 363
Phleum 356
Phlomis 246, 253
Phlox 260
Phoradendron 292
Phormium 341
Photinia 117, 129
Phragmites 354
Phryma 241
Phyllocactus 153, 154
Physalis 266, 268
Physostegia 245, 251
Phytolacca 284
PHYTOLACCACEÆ 284
Picea 312
Pickerel-weed 322
PICKEREL-WEED F. 322
Pie-plant 289
Pigweed 285, 286
Pimpernel 225
Pinckneya 174, 176
Pine 311
Pine-Apple 329
PINE-APPLE FAMILY 329
PINE FAMILY 309
Pine-sap 218
Pinguicula 225, 226
Pink 64
PINK FAMILY 63
Pink-Root 273
Pinus 309, 311
Pine-weed 61, 62
Pinxter Flower 217
Pipe-Vine 282
PIPEWORT FAMILY 352
Pipsessewa 218
Piqueria 182, 193
Pisum 98, 110
PITCHER-PLANT F. 47
PITTOSPORACEÆ 57
PITTOSPORUM FAMILY 57
Planera 296, 298
Planer-Tree 298
Plane-tree 300
PLANE-TREE FAMILY 300
PLANTAGINACEÆ 221
PLANTAIN FAMILY 221
PLATANACEÆ 300
Platanus 300
Platycerium 360, 363
Platycodon 209, 210
Pleurisy-Root 277

Plum 118
PLUMBAGINACEÆ 222
Plumbago 222
PLUM FAMILY 116
Poa 354
Podocarpus 311
Podophyllum 45, 46
Pogonia 324, 326
Poinciana 113
Poinsettia 294
Poison-Dogwood 84
Poison-Elder 84
Poison Hemlock 165
Poison-Ivy 84
Poison-Oak 84
Poke or Pokeweed 284
POKEWEED FAMILY 284
Polanisia 57
POLEMONIACEÆ 260
Polemonium 260, 262
POLEMONIUM FAMILY 260
Polianthes 330, 332
Polyanthus 223
Polygala 92
POLYGALACEÆ 92
POLYGALA FAMILY 92
POLYGONACEÆ 287
Polygonatum 339, 344
Polygonum 287
Polymnia 184, 201
POLYPETALOUS DIVISION 33
POLYPODIACEÆ 360
Polypody 363
Polypremum 273
Polypodium 360, 363
Polypodium Phegopteris 368
Polystichum 369
Pomegranate 150
Pomme Blanche 108
Pond-Lily 47
Pond Spice 291
Pondweed 316
PONDWEED FAMILY 316
Pontederia 322
PONTEDERIACEÆ 322
Poor-Man's-Weatherglass 225
Poplar 42, 308
POPPY FAMILY, Poppy 48
Populus 307, 308
Portulaca 69
PORTULACACEÆ 69
Potamogeton 316
Potato 268
Potentilla 116, 122
Poterium 117, 125
Prairie Clover 102
Prairie Dock 201
Prickly Ash 82
Prickly-Pear Cactus 153
Prickly Poppy 49
Pride-of-India 84
Prim 280
Primrose 223
PRIMROSE FAMILY 222
Primrose Peerless 330
Primula 222, 223
PRIMULACEÆ 222
Princes' Feather 286, 288
Princes-Pine 218
Prinos 219
Privet 280
Prosartes 339, 343
Proserpinaca 141
Prunus 116, 118
Psidium 149
Psoralea 95, 103
P[illegible] 82, 83
Pteris 361, 365
Puccoon 256
Pulsatilla 36
PULSE FAMILY 94
Pumpkin 159
Punica 149, 150
Purslane 69
PURSLANE FAMILY 69
Putty-Root 327
Pycnanthemum 244, 248
Pyrethrum 183, 199
Pyrola 218, 217
PYROLA FAMILY 212
Pyrrhopappus 186, 207
Pyrularia 292
Pyrus 117, 129

Quaking Grass 355
Quamash 347
Quamoclit 262, 263
QUASSIA FAMILY 83
Queen-of-the-Prairie 121, 126
Queen's Delight 295
Quercus 302
Quillwort 374
Quince 130
Quitch-Grass 356

Radish 56
Ragged-lady 40
Ragged-Robin 65
Ragweed 188
Ragwort 194
Ramie 299
Ramsted 235
RANUNCULACEÆ 33
Ranunculus 34, 37
Rape 52
Raphanus 52, 56
Raspberry 124
Rattlebox 100
Rattlesnake Grass 355
Rattlesnake Plantain 326
Rattlesnake-Root 207
Rattlesnake-Weed 207
Ray Grass 356
Red Bay 291
Red-bud 113
Red Cedar 315
Red Pepper 268
Red-root 87
Red-top 353
Redwood 314
Reed 354
Reed-Mace 319
RESEDACEÆ, Reseda 57
Resurrection-Plant 374
Retinospora 314
RHAMNACEÆ 86
Rhamnus 86, 87
Rheum 287, 289
Rheumatism-root 46
Rhexia 148
Rhodanthe 181, 190
Rhododendron 212, 216
Rhodora 212, 217
Rhubarb 289
Rhus 84
Rhynchosia 97, 110
Ribes 132, 133
Ribgrass 221
Rice 353
Richardia 317, 318
Ricinus 293, 295
Ripplegrass 221
Robinia 96, 107
Robin's Plantain 198
Rochea 138, 139
Rock-Cress 54
Rocket 53
ROCK-ROSE FAMILY 60
Roman Wormwood 188
ROSACEÆ 115
Rosa (Rose) 117, 126
Rose-apple 149
Rose-bay 216
ROSE FAMILY 115
Rose-Mallow 74
Rosemary 250
Rose of China 74
Rosin-Plant 201
Rosmarinus 245, 250
Rowan-Tree 130
Royal-Fern 372
Rubia 173, 174
RUBIACEÆ 173
Rubus 116, 124
Rudbeckia 185, 205
Rue 82
Rue-Anemone 36
RUE FAMILY 81
Ruellia 240
Rumex 287, 289
Ruscus 344
Rush 349
RUSH FAMILY 349
Russellia 221, 239
Rutabaga 52
Ruta 82
RUTACEÆ 81
Rye 357
Rye-Grass 356

Sabal 316
Sabbatia 270, 271
Saccharum 358
Sacred Bean 47
Safflower 187
Sage 249
Sagina 64, 67
Sagittaria 320
Sago Palm 309
Sainfoin 103
St. Andrew's Cross 61
St. James Lily 331
St. John's-Wort 61
ST. JOHN'S-WORT F. 61
St. Peter's-Wort 61
St. Peter's Wreath 120
SALICACEÆ 307
Salicornia 284
Salisburia 311, 315
Salix 307
Salpiglossis 229, 232
Salsify 206
Salsola 284
Saltwort 284
Salvia 245, 249
Sambucus 170, 173
Samolus 223, 225
Sand-Myrtle 217
SANDALWOOD FAMILY 292
Sand Spurrey 68
Sandwort 67
Sanguinaria 48, 49
Sanguisorba 12[illegible]
Sanicula (Sanicle) 162, 16[illegible]
SANTALACEÆ 29[illegible]
SAPINDACEÆ 8[illegible]
Sapindus 89, 9[illegible]
Saponaria 64, 6[illegible]
SAPOTACEÆ 22[illegible]
SAPPODILLA FAMILY 22[illegible]
Sarracenia 4[illegible]
SARRACENIACEÆ 4[illegible]
Sarsaparilla, Wild 1[illegible]

Sweet-Potato 268
Sweet-scented-Shrub 131
Sweet-scented Vernal-Grass 355
Sweet Sultana 188
Sweet-Verbena 242
Sweet-William 64
Swietenia Mahogani 84
Sycamore 300
Symplocarpus 317, 318
Symplocos 220, 221
Symphoricarpus 169, 170
Symphytum 255, 257
Syringa 134, 279, 280

Tacamahac 309
Tacsonia 157
Tagetes 185, 206
Talinum 69
Tallow-tree 295
Tamarack 314
Tamarix 63
TAMARISCINEÆ 63
TAMARISK FAMILY 63
Tamus 336
Tanacetum 180, 188
Tansy 188
Tansy-Mustard 53
Tape-Grass 322
Taraxacum 186, 207
Tare 110
Tarragon 189
Tartary Wheat 289
Tassel-Flower 194
Taxodium 310, 314
Taxus 310, 315
TEA FAMILY 75
Tea Plant 76
Tear-Thumb 289
Teasel 178
TEASEL FAMILY 178
Tecoma 226, 227
Ten-O'clock 346
Tephrosia 96, 106
Testudinaria 336
Tetragonia 156, 157
Tetranthera 291
Teucrium 243, 246
Thalia 328
Thalictrum 34, 36
Thea 76
Thermopsis 98, 112
Thimbleberry 124
Thistle 186
Thorn-Apple 269
Thoroughwort 192
Three-leaved Nightshade 341
Thrift 222
Thuja 310, 315
Thujopsis 315
Thunbergia 240
Thyme 249
THYMELEACEÆ 291
Thymus 244, 249
Tiarella 133, 137
Tickseed 201
Tick-trefoil 104
Tiger-Flower 335
Tigridia 333, 335
Tilia 75
TILIACEÆ 75
Tillæa 138, 139
Tillandsia 329
Timothy 356
Toad-Flax 235
Tobacco 269
Tomato 267
Toothache 82
Toothwort 55
Torenia 231, 237
Torreya 311, 315
Touch-me-not 81
Trachelium 209
Tradescantia 350, 351
Trailing Arbutus 214
Tragopogon 185, 206
Treacle-Mustard 54
Tread softly 296
Tree Clover 101
Tree Ferns 362
Tree of Heaven 83
Trefoil 101
Trichomanes 362, 371
Trichosanthes 158
Trichostema 243, 246
Trientalis 223, 224
Trifolium 95, 101
Triglochin 319, 320
Trigonella 94, 101
Trillium 337, 341
TRILLIUM FAMILY 337
Triosteum 169, 170
Tripsacum 358
Triteleia 341
Triticum 356
Tritoma 340, 348
Tritonia 333
Trollius 34, 39
Tropæolum 78, 81
True Ferns 360
True Thistle 186
Trumpet-Creeper 227
Trumpet-Flower 227
Trumpet-Leaf 48
Tsuga 313
Tuberose 332
Tulipa (Tulip 340, 346
Tulip-tree 42
Tupelo 168
Turnip 52
Turtle-head 238
Tussilago 182, 193
Twin-Flower 170
Twin-leaf 46
Twisted-stalk 343
Typha 318, 319
TYPHACEÆ 318

Ulmus 296, 297
UMBELLIFERÆ 162
Umbrella-tree 42
Unicorn-Plant 228
Urtica 297, 299
URTICACEÆ 296
Utricularia 225
Uvularia 338, 343

Vaccaria 64, 66
Vaccinium 211, 213
Valeriana (Valerian) 177
VALERIANACEÆ 177
Valerianella 178
VALERIAN FAMILY 177
Vallisneria 321, 322
Vallota 331
Vanilla-plant 191
Vegetable Serpent 158
Velvet-Grass 355
Velvet-Leaf 73
Venus's Fly Trap 60
Venus-hair 364
Venus's Looking-Glass 209
Veratrum 338, 343
Verbascum 230, 233
Verbena 241
VERBENACEÆ 241
Verbesina 184, 203
Vernonia 181, 190
Veronica 230, 233
Vervain 241
VERVAIN FAMILY 241
Vetch 110
Vetchling 110
Viburnum 170, 172
Vicia 98, 110
Victoria regia 46
Vinca 274, 275
Vincetoxicum 276, 278
VINE FAMILY 85
Viola (Violet) 58
VIOLACEÆ 58
VIOLET FAMILY 58
Viper's Bugloss 255
Virgin's-Bower 35
Virgilia 112
Virginia Creeper 86
Virginia Snakeroot 282
Virginia Stock 53
VITACEÆ 85
Vitex 241, 243

Wake Robin 341
Waldsteinia 116, 121
Walking-leaf 367
Wallflower 54
Wall-Pepper 139
Wall-Rue 367
Walnut 300
WALNUT FAMILY 300
Water Arum 318
Water Beech 305
Water Chinquepin 47
Water-cress 53
Water-Hemlock 165
Water-Horehound 247
Waterleaf 259
WATERLEAF FAMILY 258
Water-Lily 47
WATER-LILY FAMILY 46
Watermelon 160
Water-Milfoil 141
WATER-MILFOIL F. 140
Water Oats 353
Water-parsnip 165
Water-pennywort 164
Water Pepper 289
Water-Plantain 320
WATER-PLANTAIN F. 319
Water-pimpernel 225
Water-shield 46
Water Star-Grass 322
Water Violet 225
Water-weed 322
WATER-WORT FAMILY 63
Watsonia 333
Wax-Myrtle 306
Wax-Plant 278
Wax-work 88
Wayfaring-tree 172
Weld 57
Wellingtonia 314
Whahoo 298
Wheat 357
Whin 100
White Alder 217
White Bent Grass 353
White Cedar 315
White Lettuce 207
White Thorn 128
Whiteweed 199
White-wood 42
Whitlavia 258, 260
Whitlow-Grass 55
Whortleberry 213

WHORTLEBERRY F. 211
Wigandia 258
Wild Allspice 291
Wild Balsam-Apple 160
Wild bean 108
Wild Bergamot 250
Wild Comfrey 257
Wild Ginger 282
Wild Hyacinth 347
Wild Liquorice 175
Wild-Potato-Vine 264
Willow 307
WILLOW FAMILY 307
Willow-herb 143
Wind-flower 35
Windsor Bean 111
Winterberry 219
Winter-cress 54
Wintergreen 214, 218
Wire-Grass 354–356
Wistaria 97, 108
Witch Grass 357
Witch-Hazel 140
WITCH-HAZEL FAMILY 140
Woad 56
Woad-Waxen 100
Wolfsbane 41
Wood-Betony 239
Woodbine 170
Wood-Nettle 299
Wood-Rush 350
Woodsia 361, 370
Wood-Sorrel 78
Woodwardia 361, 366
Worm-Grass 273
Wormseed 285
Wormseed-Mustard 54
Wormwood 188

Xanthium 180, 188
Xerophyllum 338, 342
Ximinesia 184, 203
XYRIDACEÆ 351
Xyris 351

Yam 336
YAM FAMILY 335
Yard-Grass 356
Yarrow 199
Yellow Bachelor's-Button 92
Yellow-Eyed Grass 351
YELLOW-EYED GRASS FAMILY 351
Yellow Jessamine 273
Yellow Pond-Lily 47
Yellow puccoon 38
Yellow-Rocket 54
Yellow-Wood 112
Yew 315
YEW FAMILY 310
Yucca 340, 348
Yulan 43

Zamia 309
Zanthorhiza 34, 38
Zanthoxylum 82
Zauschneria 142, 143
Zea 358
Zinnia 185, 206
Zizania 353
Zostera 316
Zygadenus 338, 343

THE END.